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## WORK PLAN For Interim Measures Cleanup At

Solid Waste Management Units #03/10, #10/15, #12/14, and #13/14 and Soils Bioremediation Facility

NSWC CRANE Crane, Indiana

CONTRACT #N62467-93-D-1106 DELIVERY ORDER #0009 STATEMENT OF WORK #007

> July 19, 1996 Revision 1

Prepared For:

## SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND

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2420 Mall Drive Corporate Square 1 - Suite 211 North Charleston, South Carolina 29406

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**Interim Measures Cleanup** 

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> **Naval Surface Warfare Center** Crane, Indiana

> > **Revision 1** July 19, 1996

CONTRACT N62467-93-D-1106 **DELIVERY ORDER 0009** STATEMENT OF WORK 007

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U.S. Navy Responsible Authority	Date

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#### **TABLE OF CONTENTS**

SECTION	PAC	ìΕ
1.0 INT 1.1	ODUCTION	
2.0 ENV 2.1 2.2	RONMENTAL COMPLIANCE REGULATORY COMPLIANCE PERMITS, APPROVALS, AND NOTIFICATIONS 2.2.1 Construction Permits 2.2.2 Notifications 2.2.3 Environmental Permits	7 8 9 9
3.0 PRO	JECT ORGANIZATION	11
4.0 PRC 4.1	4.1.4 Compost Building Area 4.1.5 Amendment Storage/Work Area 4.1.6 Amendment Haul Road Area 4.1.7 Equipment and Personnel Decontamination Area	15 15 15 16 16 17 17 18 18 19 19 19 19 19 19 19 19 19 19 19 19 19
	, ,	31 31

### **TABLE OF CONTENTS (Continued)**

SEC1	<u>P</u>	<u>AGE</u>
	4.4 SWMU #12/14 - MINE FILL A 4.4.1 Work Scope 4.4.2 Site Assessment 4.4.3 Mobilization 4.4.4 Excavation of Contaminated Soil 4.4.5 Soil Sampling and Analysis 4.4.6 Site Cleanup 4.4.7 Backfilling and Site Restoration 4.5 SWMU #13/14 - MINE FILL B 4.5.1 Work Scope 4.5.2 Site Assessment 4.5.3 Mobilization 4.5.4 Excavation of Contaminated Soil 4.5.5 Soil Sampling and Analysis 4.5.6 Site Cleanup 4.5.7 Backfilling and Site Restoration	. 31 . 32 . 32 . 34 . 35 . 35 . 35 . 35 . 35 . 35
5.0	QUALITY CONTROL	. 39
6.0	SAFETY AND HEALTH	. 40
7.0	DECONTAMINATION ACTIVITIES  7.1 MINIMIZATION OF CONTAMINATION  7.2 DECONTAMINATION FACILITIES  7.3 PERSONNEL DECONTAMINATION  7.4 DECONTAMINATION OF HEAVY EQUIPMENT  7.5 DECONTAMINATION OF SAMPLING EQUIPMENT	. 41 . 41 . 42 . 42
8.0	WASTE MANAGEMENT	. 44
9.0	ENVIRONMENTAL PROTECTION	. 45
10.0	SCHEDULE	. 46
11.0	REFERENCES	. 48

#### **TABLES**

TABL	<u>PAGE</u>
3-1	Project Responsibilities
	FIGURES
	FIGURES
FIGU	<u>PAGE</u>
1-1 1-2 3-1 4-1 4-2a 4-2b 4-2c 4-3 4-4 4-5	Vicinity Map of NSWC Crane, Indiana 5 Location of Solid Waste Management Units 6 Organization Chart 12 SWMU #03/10 Ammunition Burning Ground Location Map 23 SWMU #03/10 ABG Explosives Contaminated Area, 0" to 30" Depth 25 SWMU #03/10 ABG Metals Contaminated Area, 0" to 30" Depth 26 SWMU #03/10 ABG Metals and Explosives Contaminated Area, 30" to 90" Depth 27 SWMU #10/15 Rockeye Munitions Soil Excavation Area 30 SWMU #12/14 Mine Fill A Soil Excavation Area 33 SWMU #13/14 Mine Fill B Soil Excavation Area 37
	LIST OF APPENDICES
APPE	<u>ENDIX</u>
A B C	INSPECTION ITEMS

## 1.0 INTRODUCTION

The Naval Surface Warfare Center (NSWC) Crane is located in southwestern Indiana, as shown in Figure 1-1, and provides support for equipment, shipboard weapons systems, and ordnance. In addition, NSWC supports the Crane Army Ammunition Activity (CAAA) including production and renovation of conventional ammunition, storage, shipment, and demilitarization and disposal of conventional ammunition.

This work plan has been prepared by Morrison Knudsen (MK) for the Naval Facilities Engineering Command (NAVFACENGCOM), Southern Division pursuant to the scope of work defined in Delivery Order #0009, Statement of Work #007, under Contract #N62467-93-D-1106. This work plan describes the methods to be used to perform interim measures explosives contaminated soil cleanup activities required at four Solid Waste Management Units (SWMUs): #03/10 Ammunition Burning Ground (ABG), #10/15 Rockeye Munitions, #12/14 Mine Fill A (MFA), and #13/14 Mine Fill B (MFB). This Work Plan also describes the design and construction criteria to be used to construct a Solid Waste Bioremediation Facility for performing explosives contaminated soil cleanup. A complete description of the bioremediation process and operational requirements is fully described in the Operational Plan. The Quality Assurance, data collection, and sampling and analytical requirements are described in the Quality Assurance Project Plan. Both documents are issued under separate cover.

The ABG area is located in the eastern portion of the NSWC, as shown in Figure 1-2, and occupies approximately 50 acres. Access is by Highway H-462 via H-58, H-274 and H-463. The ABG has been used extensively since the 1940s to destroy materials contaminated with explosives, bare explosives, rocket motors, candles, flares, solvents, red phosphorus, small detonators, and fuse materials. The largest quantities were destroyed between 1956 and 1960, when 15,000 pounds per day of smokeless powder and 48,000 pounds per day of high explosives were burned directly on the soil surface. Ammunition burning is now performed in clay-lined steel pans (ACOE, 1992a). The area is also used for flashing the residue from bombs and projectiles after they have been melted or drilled out to remove the bulk of the explosives. Close coordination between NSWC operations personnel and the remediation personnel will be required to minimize any impact to ongoing operations.

To fulfill the Corrective Action Requirements of its RCRA Permit the NSWC Crane has conducted a RCRA RFI Part 2, Phase III Soils Study for the ABG, SWMU #03/10. (ACOE, 1995) Thirty-three surface soil samples were collected and thirty-two borings were made in August 1993 to determine the extent of soil contaminants identified in the Part 1 RFI Phase III soils investigation.

The results indicated total xylene, ethylbenzene and toluene were detected in surface soil at concentrations ranging from 0.00061 to 0.0091 mg/kg. TCE was detected at a maximum concentration of 0.017 mg/kg. This TCE value fell below the risk-based

concentration (RBC) of 3 mg/kg, for a soil to air, inhalation scenario (USEPA, 1995). TCE concentrations also did not exceed residential values for soil ingestion (58 mg/kg). PAHs were detected in 9 of 33 samples collected. The highest PAH concentration detected was 0.37 ppm (benzo(b)fluoranthene). All detected concentrations were below RBCs.

Eight explosives (HMX, RDX, TNT, TNB, 2,4-DNT, 2,6-DNT, 2A-DNT and 4A-DNT) were detected in surface soils collected during the August, 1993 study. The maximum detected concentrations for HMX, RDX and TNT were 223 mg/kg, 1820 mg/kg and 136 mg/kg, respectively. Concentrations of metals detected during the study were compared to background levels for the site. Calcium, cadmium, copper, lead and zinc were found in surface soils at 100 times background levels. Magnesium, silver, tin and phosphorus were detected at concentrations 10 times above background levels. (ACOE, 1995)

The Rockeye Munitions area is located in the northeastern portion of the NSWC at the intersection of Highways H-161 and H-45, as shown on Figure 1-2. This area, an NSWC operating unit, is a production facility that was formerly a press-loading operation for 3-inch projectiles. It was later converted to a case-filling operation for cluster bombs. A large volume of wastewater is produced by the operation and is collected in sumps. Prior to 1978, explosive-contaminated waters from full sumps were discharged directly to a branch of Sulfur Creek on the north side of the facility and to Turkey Creek, a tributary to Boggs Creek, on the south. Residues from the sumps are now pumped and transported to an on-site treatment facility (ACOE, 1992b).

The subsurface soil contamination ranges up to 42.7 mg/kg for individual constituents. Surface soil samples contained contamination levels from undetectable amounts to as high as 10,400 mg/kg. DNB, DNT, and TNB were found at concentrations below quantitation limits (the concentration reported was estimated) and tetryl was not detected at all. TNT was found in surface samples at a maximum concentration of 295 mg/kg and at a maximum level of 1.40 mg/kg in subsurface samples. An RDX concentration of 3,350 mg/kg was found in surface samples. HMX was found in more samples and at higher concentration than any other explosive compound analyzed. Subsurface soil samples contained HMX at concentrations above quantitation limits. HMX concentrations of 1,960 and 10,400 mg/kg were found in surface soil samples from two areas. The surface soils beneath the exhaust of a Rockeye building ventilator contained concentrations of TNT, RDX, and HMX at 295, 3,350, and 10,400 mg/kg, respectively. These concentrations were the maximums for these compounds in the sampled Rockeye soils (ACOE, 1992a).

Mine Fill A is located in the west-central portion of NSWC as shown on Figure 1-2. Mine Fill A consists of 29 buildings situated along Highway H-17 and has been used to manufacture mines, depth charges, rocket heads, aerial bombs, and projectiles. Currently, Mine Fill A is used to produce 2,000-pound aerial bombs. Demilitarization activities also take place in this area. The major sources of contamination are

washdown operations and the exhaust ventilation system. Potential contaminants include TNT, RDX, and HMX, and explosive-contaminated wastewaters. Concentrations of individual constituents ranged from undetected to 15,300 mg/kg. Based on operational practices, location, and waste characteristics, releases to groundwater may have occurred. Analytical records and reports indicate releases to surface water and air have also occurred. Releases to soil are documented by analytical records and direct observation (Halliburton, 1992).

Mine Fill B is located in the west-central portion of NSWC as shown on Figure 1-2. Mine Fill B consists of 39 buildings and is situated along Highway H-18. Historically, its operations were similar to Mine Fill A. It is currently used for the renovation and rework of munitions. Activities include the application of enamel and bituminous solvent coatings, rotary grit blasting, spray painting, propellant removal, and fuse and configuration changes. Explosive particulate matter was exhausted through the ventilation system. Rinse and wastewater containing TNT, Composition B, HBX-1, HBX-3, and H6 are potential contaminants. Concentrations of individual explosives in soils ranged from undetected to 24,000 mg/kg. Based on operational history, physical condition, location, waste characteristics, visual evidence, and analytical data, releases to groundwater, surface water, soil, and air have occurred.(Halliburton, 1992)

The Soils Bioremediation Facility will be constructed to treat explosives-contaminated soil. It will be located near the NSWC landfill, south of the Burns City Gate. The Facility will treat the contaminated soil in three open-sided buildings using an amendment mix based on bench-scale testing of Crane soils and results from the Umatilla Army Depot composting activities. The treatment building floors will be concrete while the amendment storage and work areas will be surfaced with asphalt. Storm water run-on and run-off will be controlled with berms and contained in retention basins. Equipment leaving the treatment area will be decontaminated at a truck wash facility.

#### 1.1 OBJECTIVES

The Department of Defense (DOD) has utilized bioremediation, or composting, to treat explosives-contaminated soil since 1982. Additionally, bioremediation has proven to be successful at other sites having explosives-contaminated materials (Weston 1993). Explosive-contaminants that have been successfully broken-down by composting include: TNT, RDX, HMX, Tetryl, and nitrocellulose in soils and sludges (USEPA 1993a, 1993b). The preferred treatment alternative for explosives-contaminated soils from the ABG, Rockeye, Mine Fill A, and Mine Fill B Solid Waste Management Units at NSWC Crane is on-site bioremediation. Bioremediation is the preferred soil treatment alternative because of its ability to treat on-site with limited transportation, lower costs, high treatment efficiency, reduction of long term liability associated with landfilling, and public acceptance.

The objective of the bioremediation or composting facility is to reduce the explosive contaminant levels to the levels established in the Pilot Scale Operation utilizing a batch composting system. Each batch composting system is projected to take approximately 28 days to achieve explosives-contaminated soil cleanup levels.

MK's goal is to cost-effectively and efficiently execute the work in accordance with the Delivery Order requirements, while meeting or exceeding all site-specific, local, state, and federal requirements. The primary MK work objectives are to:

- Perform all work in a manner that maximizes worker safety and minimizes environmental impacts.
- Excavate and remove explosives contaminated soil from specified areas and transport the soil to the bioremediation facility for treatment.
- Restore the excavated areas to original grade.
- Establish and operate the Bioremediation facility for one year to biodegrade explosives in contaminated soil. The Navy will be responsible for operation and maintenance of the facility for the remaining years of bioremediation of explosives contaminated soil.

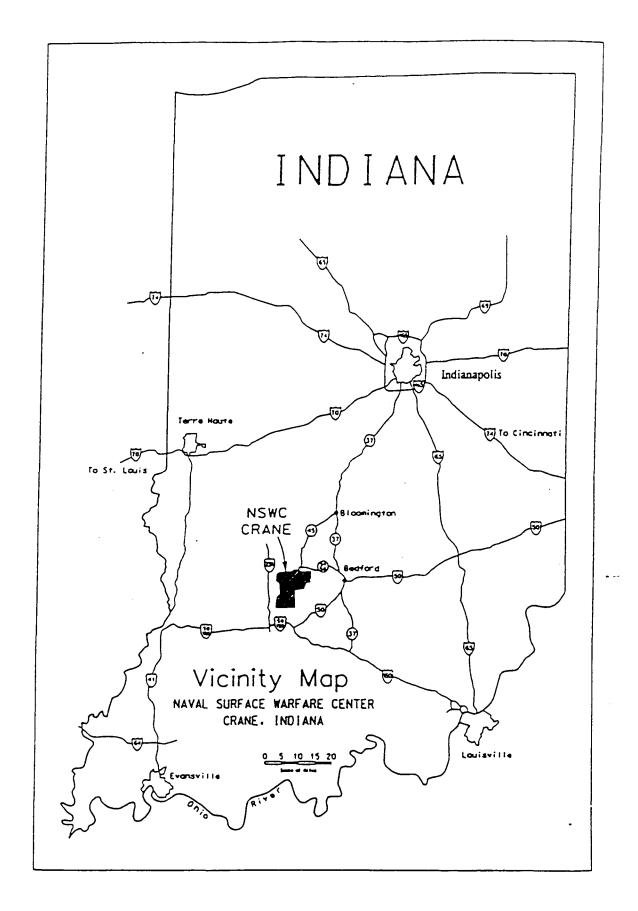
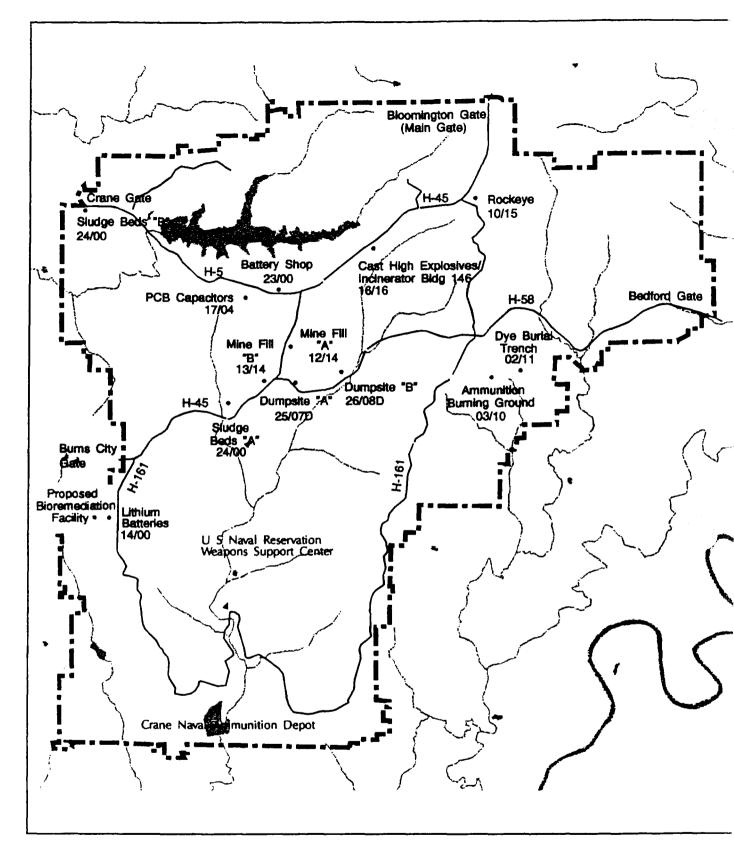
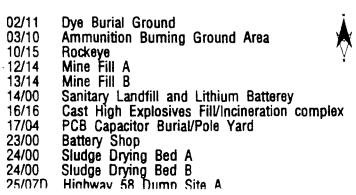


Figure 1-1
Vicinity Map of NSWC Crane, Indiana





## Figure 1-2 Location of Solid Waste Management Units





## 2.0 ENVIRONMENTAL COMPLIANCE

Promulgation of the Environmental Protection Agency's (EPA's) regulatory program under the Resource Conservation and Recovery Act (RCRA) provided the impetus to identify and control environmental contamination from past practices at NSWC Crane. On December 23, 1989 the USEPA issued the federal portion of the final RCRA permit for NSWC Crane to the U.S. Navy and issued the permit renewal for a period of five years on July 31, 1995. This permit contains both the Federal permit conditions and State permit conditions, which were issued separately by the State of Indiana RCRA program. It established the Hazardous and Solid Waste Amendment (HSWA) Corrective Action Requirements and Compliance Schedules obligating the U.S. Navy to perform Remedial Field Investigations (RFIs) at 30 SWMUs, to conduct Corrective Measures Studies, and to implement corrective measures if needed.

#### 2.1 REGULATORY COMPLIANCE

The following regulations, guidance, and procedures may affect the work at SWMUs #03/10, #10/15, #12/14, #13/14, and the Soils Bioremediation Facility:

- U.S. Navy or NSWC Crane guidance
- U.S. Occupational Safety and Health Administration
   29 CFR 1910, Occupational Safety and Health Standards
   29 CFR 1926, Safety and Health Regulations for Construction
- U.S. Army Corps of Engineers
   EM-385-1-1, Safety and Health Manual
- U.S. Environmental Protection Agency
   40 CFR 257, Criteria for Classification of Solid Waste Disposal Facilities and Practices.

40 CFR 261, Identification and Listing of Hazardous Waste. Compliance will be required to characterize the waste, specifically, part 261.3 (a) (ii).

40 CFR 264, Subpart S Corrective Action.

Indiana Department of Environmental Management

327 IAC 15, NPDES General Permit Rule. This regulation prescribes policies, procedures, and technical criteria to operate

and discharge under the requirements of a NPDES general permit rule.

329 IAC 3.1-6, Identification and Listing of Hazardous Waste. This regulation incorporates by reference the federal regulations with a few additions.

329 IAC 3.1-7, Standards Applicable to Generators of Hazardous Waste. This regulation incorporates by reference the federal regulations with a few changes and additions.

#### U. S. Department of Transportation

49 CFR 172, Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements. This part describes requirements for completing shipping papers; marking, labeling, and placarding; training; and emergency response.

49 CFR 173, General Requirements for Shipments and Packaging. This part describes classification and packaging of hazardous materials.

All waste products from the activities in this Work Plan will be disposed of as described in the Waste Management Plan (WMP) in compliance with federal and state hazardous and solid waste regulations. The state regulations incorporate the federal regulations with few exceptions; however, particular attention will be paid to the state manifesting requirements.

Off-site transportation of any hazardous waste or material requires compliance with the DOT hazardous material transportation rules. The particular requirements are listed in the WMP. The Site Shipping Officer (SSO) will coordinate the shipping effort. MK will not sign any manifests.

All excavations must comply with the NSWC Crane site requirements. Subcontractors will notify MK, and MK will in turn notify the NSWC Crane Site Representative of all construction activities, as outlined in Section 2.2 below.

#### 2.2 PERMITS, APPROVALS, AND NOTIFICATIONS

Several permits, approvals, and notifications will be required for implementing the Work Plan interim measures cleanup activities and are summarized in the following sections.

#### 2.2.1 Construction Permits

The NSWC Crane facility requires issuance of construction permits before construction initiation.

An Excavation and Trenching Permit will be required for each area and will include a statement of clearance for safe access based on the removal or absence of unexploded ordnance in the work zone. The MK Project Manager (PM) will be responsible for obtaining this permit through the Public Works Department, Building 2516.

An <u>Erosion Control Plan</u> is required to be prepared and approved by IDEM for all areas affected by construction activities greater than five acres. The Bioremediation Facility is estimated to affect a total of 5.85 acres. A Soils Erosion Control Plan for Bioremediation Facility, dated March 8, 1996 has been submitted and approved by IDEM through the Martin County Soil and Water Conservation District.

A <u>NSWC Crane Landfill Permit Modification</u> is required to be prepared and approved by IDEM for the deletion of the property, allocated for the Bioremediation Facility, from the landfill permit boundaries. This permit modification has been prepared, submitted and approved by IDEM.

#### 2.2.2 Notifications

All federal, state, and local agency notifications will be performed by the NSWC Crane Site Representative. All MK subcontractors will notify the PM, and the PM will in turn notify the NSWC Crane Environmental Protection Department of all interim measures cleanup activities. These notifications include, but are not limited to:

- Clearing and grubbing.
- Trenching and excavation.
- Backfilling and compaction.
- Storage and handling of hazardous materials.
- Inspection, manifesting, and shipping of hazardous materials.
- Construction activities.

During interim measures cleanup activities, as described in this Work Plan, emergency notifications will be required in case of fire, explosion, or spills. Notifications shall be made according to the Emergency Response Plan as described in the Task-Specific Site Safety and Health Plan (SSHP) for this Work Plan.

#### 2.2.3 Environmental Permits

Pink water generated from TNT operations is a specific source hazardous waste listed for reactivity (waste code K047). The reactivity threshold is defined as 10 % or 100,000 parts per million (ppm)(Kristoff, 1987). The excavated soil, a media containing K047

listed waste, is considered a hazardous media, as defined in 40 CFR 261.3, unless the media is decontaminated (treated) and no longer exhibits the hazardous characteristic. All soils to be excavated and remediated in the Bioremediation Facility will be mixed with manure wastes and amendments to form a compost mixture. The resultant mixture will be well below the defined reactivity threshold and therefore, a non-hazardous waste. Those soils classified as hazardous due to elevated TCLP levels of lead and cadmium will not be treated onsite without specific containment controls instituted and EPA approval.

Based on this classification of the waste to be treated, the Bioremediation Facility and buildings have been designed and approved as a solid waste and contaminated media treatment facility meeting the applicable codes and standards.

A <u>Storm Water Discharge Permit Modification</u> is required for the discharge of the stormwater collected in the retention/storage ponds. This permit modification will be submitted to IDEM for approval by NSWC Crane prior to facility construction completion.

## 3.0 PROJECT ORGANIZATION

The project team organization for this Delivery Order is shown in Figure 3-1. The responsibilities of each team member are listed in Table 3-1.

The team is structured to provide the maximum flexibility and efficiency in the execution of this Delivery Order. This flexibility and efficiency will facilitate changes that may occur in the related scope of work.

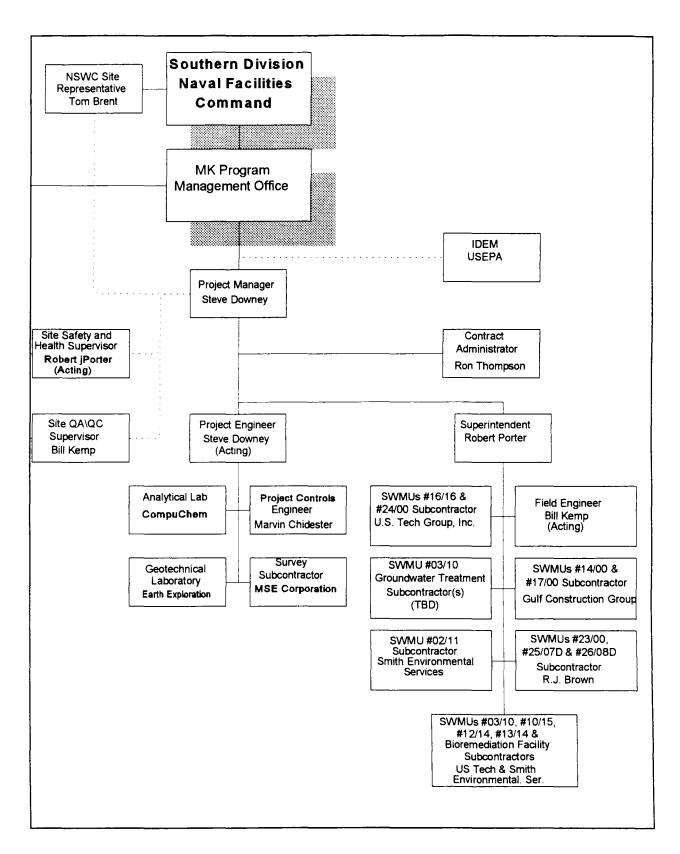


Figure 3-1
Organization Chart

Table 3-1
<b>Project Responsibilities</b>

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TEAM MEMBERS	RESPONSIBILITIES	
NAVFACENGCOM Southern Division	Overview of project execution and coordination between Contractor, NSWC Crane, and other agencies.	
Program Management Office (PMO)	Overall responsibility for all cleanup measures at all sites in the Southern Division of the Naval Facilities Engineering Command under Contract No. N62467-93-D-1106. The PMO is the point of contact for Southern Division.	
NSWC Site Representative	Southern Division's on-site representative and is the liaison between NSWC officials and the Project Manager for the SWMUs at NSWC Crane.	
Project Manager (PM)	Overall responsibility for implementing this Work Plan and all other project activities. The PM will control all on-site forces to ensure completion of project tasks.  • Single point of contact for Southern Division liaison.  • Coordinates the project resources to ensure compliance with the appropriate plans, procedures, and regulatory requirements,  • Oversees all personnel on-site and coordinates with the PMO.	
Project Engineer (PE)	<ul> <li>Reports to the PM and will act as the Assistant Project Manager. Specific responsibilities include:</li> <li>Supervises the activities of the project field staff (regulatory specialists, geologists, field engineers, etc.).</li> <li>Coordinates with the Site Superintendent to ensure that activities are properly coordinated between subcontractors.</li> <li>Coordinates the activities of the support staff and provides project status reports to the PM.</li> <li>Maintains project records and prepares technical scopes of work for subcontractors.</li> <li>Directs the efforts of technical subcontractors (i.e., surveying, sampling and testing).</li> </ul>	
Cost and Schedule Engineer	Reports to the PE and has primary responsibility for the maintenance of the cost and schedule control systems, including regular assessments of performance.  Provides administrative support services. Evaluates cost and schedule information and provides status reports. Prepares monthly progress reports. Reviews cost/schedule submissions by subcontractors. Verifies progress against payment requests. Maintains the document control system. Maintains contract change notice log and trend logs.	
Contract Administrator	Provides administrative support to the technical staff for contractual and procurement activities.  Prepares subcontract bid packages. Issues and provides support in the administration of subcontracts.  Monitors SB/SDB compliance. Monitors purchase orders.	

•	Table 3-1
<b>Project</b>	Responsibilities

TEAM MEMBERS	RESPONSIBILITIES	
Site Safety and Health Officer (SSHO)	<ul> <li>Reports to the PMO. Implements and ensures compliance with the Task-Specific Site Safety and Health Plan (SSHP). Tracks and reports on safety-related matters.</li> <li>Responsible for the control and elimination of existing and potential industrial hazards.</li> <li>Implements and executes personnel monitoring program to ensure proper monitoring of internal and external exposures.</li> <li>Provides site-specific training to personnel as required by the SSHP.</li> <li>Tracks all personnel training requirements, survey data, certifications, and records to ensure compliance with plans and regulations.</li> <li>Assists in developing and implementing the SSHP.</li> <li>Reviews and approves subcontractor Safety and Health Plans and Programs. Conducts audits as appropriate to ensure compliance.</li> <li>Reviews and approves work permits for appropriate industrial hygiene and safety controls.</li> <li>Provides monitoring to ensure the protection of project personnel, the public, and the environment,</li> <li>Maintains an inventory of industrial hygiene and safety supplies as appropriate.</li> <li>Maintains monitoring equipment and calibration records.</li> <li>Stops work when necessary to ensure the safety of personnel and to prevent damage to the environment.</li> </ul>	
Site Superintendent	Reports to the PM and has primary responsibility for the coordination and control of all field activities to ensure that all tasks included in this Work Plan are completed.  Coordinates the activities of all subcontractors. Directs all subcontractors together with the PE.  Provides daily reports to the PM and PE on the status of field activities.	
Site Quality Control Officer (SQCO)	<ul> <li>Reports to the PMO and has primary responsibility for verifying a consistently high level of quality for the project.</li> <li>Reviews and checks all documents, reports, and testing results.</li> <li>Coordinates with procurement, engineering, and cost/schedule departments.</li> <li>Observes all field activities to ensure compliance with this Work Plan and the QAPP and completes Field Inspection Checklists (Appendix A).</li> <li>Keeps minutes of the periodic quality meetings.</li> <li>Implements the three phases of quality control: Preparatory, Initial, and Follow-up inspections.</li> <li>Ensures tracking and resolution of nonconformance/rework items.</li> </ul>	
Note: See Section 3 of	the Task-Specific Site Safety and Health Plan for names and contact.	

## 4.0 PROJECT EXECUTION

This section details the work for the Soils Bioremediation Facility and the four SWMUs covered by this Work Plan. Complete operation and process procedures are provided in the Operational Plan for SWMU's #03/10, #10/15, #12/14, #13/14, and Soils Bioremediation Facility issued under separate cover. Complete sampling and analytical procedures are provided in the Quality Assurance Project Plan also issued under separate cover.

Unexploded Ordnance (UXO) clearances, excavation permits, hot work permits, and other required approvals will be obtained before performance of any field work beyond visual survey and walk-arounds. All activities will also be coordinated with operations activities near the work areas. These clearances, permits, and approvals will be obtained from the NSWC Site Representative.

#### 4.1 SOIL BIOREMEDIATION FACILITY

This section describes the construction of a bioremediation facility. The design layout and details for the facility are shown on Drawings C-100 through C-112, S-100 through S-103, E-100 through E-109, F-1, F-2, and A-1 through A-3. The facility will be located south of the Burns City Gate near the NSWC Crane landfill as shown in Figure 1-2.

#### 4.1.1 Work Scope

The scope of work includes all necessary work required to build a Bioremediation Facility for the purpose of composting of explosives contaminated soil. The following descriptions are supported by design drawings and technical specifications provided in Appendix B and C.

The Bioremediation Facility is shown on drawing C-100, provided in Appendix C, and consists of the following basic design elements:

- Three 70 feet wide by 300 feet long composting buildings,
- Amendments storage area,
- · Amendment haul road area,
- Equipment and personnel decontamination areas,
- · Office and laboratory trailer area
- · Stormwater diversion and retention controls, and
- Basic services and utilities including a water supply source for dust suppression and compost moisture additions.

#### 4.1.2 Site Assessment

An Environmental Conditions Report and a topographic survey will be conducted to record site conditions prior to construction. Soil samples will be collected and analyzed to establish background conditions prior to facility construction.

#### 4.1.3 Mobilization

The first step in mobilization will be to define the work area configuration. Since this area is a non-potentially contaminated area (virgin soil), defining the exclusion, contamination reduction and support boundaries will not be necessary, however, the work area boundary, site grading benchmarks, and control points will be established. After the work area configuration is defined, the access routes will be established. Tools, equipment, and supplies will be delivered to the site and the personnel mobilized.

The general condition of the equipment will be inspected and tested to ensure that all safety systems and alarms are functional. The performance of the equipment will be tested to determine if the equipment can perform the required tasks.

#### 4.1.4 Compost Building Area

The Compost Building Area is located in the south central and eastern portions of the Bioremediation Facility as shown on drawing C-100. The compost structures (Drawing C-102) shall consist of three 70 feet by 300 feet pre-engineered buildings which are used to shelter the composting operations. The compost structures will consist of a metal structural frame with a light-weight roof designed to accommodate both local climatological conditions and the height of equipment selected for composting operations. The sides of the compost structures will be screened with a fabric mesh. The floors of the compost structures will be concrete, over six inches compacted #2 limestone, sloped to an epoxy paint-coated fluid collection sump. Maintenance of compost moisture within the covered treatment area is expected to generate little or no leachate fluids. However, each of the three structures will be equipped with a sump for contingency purposes. Sump water will be recycled back into the composting process as moisture control.

A six inch high concrete curb will be provided around the entire perimeter for run-on and run-off control. Entrance ramps will be provided at each end of the buildings for vehicle traffic. Removable walls constructed of precast concrete interlocking blocks (drawing S-103) will be installed along the entire inside perimeter of the three compost buildings (less the end openings) to provide a four feet high wall for compost containment.

A one and one-half inch underground water line (100 psi supply pressure) and valve will be provided to one location of each compost building as shown on drawing C-100. An emergency eye wash station will be provided for each building with a water supply line connection. The eye wash station will have freeze protection, galvanized steel piping construction, water supply isolation valve, water supply regulator/reducing valve, hinged dust covers and push handle, catch basin, and meets ANSI Z358.1-1990 requirements.

The area around the buildings will be surfaced with sealed asphalt paving over compacted limestone base and subbase. The entire area will be stripped of all vegetation, proof rolled to detect and correct soft spots, and brought to proper grades. The subbase will be six inches of compacted #2 limestone and the base surface will be six inches of #53 compacted limestone. The paving surface will consist of a two inch asphalt binder course and a two inch asphalt wearing course coated with sealant to

prevent contaminant migration. The outer perimeter of the paving surface will have a six inch high asphalt curb. The paving will slope to the southwest corner of this area where a storage/retention pond will be located. The storage/retention pond will consist of an 80 mil HDPE liner and a low point sump to allow for pond drainage by way of a four inch CPVC valve and outfall pipe or by way of a vacuum truck. A continuous ten foot high chain link fence with a man way gate shall be provided around the retention pond.

#### 4.1.5 Amendment Storage/Work Area

The amendment storage area will be located in the southeast section of the Bioremediation Facility as shown on drawing C-100 and used to store alfalfa and manure amendments. The amendment storage/work area will be provided with a subbase of six inches of compacted #2 limestone and a base of six inches of #53 compacted limestone. The paving surface will consist of a two inch asphalt binder course and a two inch asphalt wearing course coated with an approved sealant to prevent contaminant migration. The outer perimeter of the paved surface will have a six inch high asphalt curb for run-on and run-off control. The amendment storage/work area paved surface will slope to the southern edge of this area where a second storm water storage/retention pond shall be located.

The amendment storage area will have two bins for storing the amendment materials used in the composting operation. The bin side walls will be constructed of precast concrete interlocking blocks which can be adjusted as required to accommodate different storage configurations. The southeast wall of the amendment storage area will be constructed of 12 inch CMU, reinforced concrete filled, and acts as a retaining wall for the one and one-half feet elevation drop from the amendment haul road.

A 500 gallon capacity diesel fuel storage tank and containment pad will be located on the north central edge of the amendment storage/work area. The containment pad will be cast concrete with eight inch CMU block walls two courses high. The pad and walls will be coated with an epoxy paint and provided with a two inch drain pipe and valve for stormwater discharge.

#### 4.1.6 Amendment Haul Road Area

The amendment haul road area will be located in the southeast portion of the Bioremediation Facility as shown on drawings C-100. The amendment haul road will be constructed of 12 inches of compacted limestone. The area will be provided with drainage swales on both sides of the haul road to maintain proper drainage and corrugated steel culverts at each end of the haul road. Anchored parking logs will be provided in the truck unloading area at the edge of the retaining wall. Traffic bollards will be provided along the northeast side of the retention/storage pond and at the existing monitoring well located at the north end of the haul road.

#### 4.1.7 Equipment and Personnel Decontamination Area

#### 4.1.7.1 Equipment Decontamination Facility

The Bioremediation Facility will be provided with a vehicle wash area, a fluid collection and storage sump, a toilet facility and an equipment room as described below.

As shown on Drawing S-100, the <u>vehicle wash area</u> will be an eight inch curbed concrete slab with entrance ramps at each end and an eight inch CMU wall on both sides to contain the decon spray. The flooring will slope to the center of the wash area where a collection trench with grating will provide drainage of the fluid to the collection sump. All necessary equipment and controls for operation of a hand wand spray wash system will be provided as described in the technical specifications and drawings. The decontamination area and collection sump subject to wash fluid exposure will be epoxy paint coated for protection.

As shown on Drawing S-100, the <u>fluid collection and storage sump</u> will be 4000 gallons capacity and constructed of concrete, coated with epoxy paint for protection. The sump will have checkered floor plate covers to prevent rain water collection and a small section of steel grating at the north end to serve as a boot wash area. The checkered plate will have a small removable section located over the sump low point for access to allow fluid and sediment removal with a vacuum hose.

As shown on Drawing S-101, the toilet facility and equipment room will be constructed of eight inch CMU with steel roof joists. The toilet room will be provided with a toilet, lavatory, urinal and a floor drain. The equipment room will house the high pressure wash system and water heater and also have a floor drain. This building will be heated and cooled with a window type heat pump unit having a heating capacity of 10,000 BTU and a cooling capacity of 6,000 BTU. Utility water will be provided by extending a one and one-half inch supply line from the existing storage shed supply tie-in point. The sanitary sewer line from the toilet room will be routed to the pump/lift station in the office/laboratory area.

#### 4.1.7.2 Personnel Decontamination Facility

The personnel decontamination area consist of a shower/locker room trailer with change room area, lockers, lavatory, toilets and showers. The northern end of the trailer will serve as a lunch/conference room. The sanitary sewer line is routed to the pump/lift station in the office/laboratory area.

#### 4.1.8 Office and Laboratory Trailer Area

The office and on-site laboratory trailers will be located north of the compost building area as shown on drawing C-100. They will be provided with a compacted limestone parking area with parking logs for 24 vehicle capacity. Sanitary sewer service will be provided by way of a grinder pump/lift station with the discharge routed to the existing

sanitary sewer force main located north of the landfill access road. The existing roadside drainage swales will be regraded to provide proper drainage.

The on-site laboratory trailer will contain the necessary equipment and supplies to support the required monitoring and on-site sample screening requirements as described in the Operational Plan.

#### 4.1.9 Stormwater Diversion and Retention Controls

The facility will utilize both the existing topography and site drainage controls to control stormwater runoff and run-on as shown on drawing C-100.

Two lined stormwater retention basins sized to store rainfall from a 10-year, 24-hour storm will be constructed inside the Bioremediation Facility. They will allow for controlled on-site stormwater storage/retention and off-site stormwater discharge. Water collected in the retention basin will be sampled following a storm to determine whether the water meets off-site discharge requirements. Water not meeting off-site discharge requirements will either be recycled in the soil treatment area for compost moisture addition or transported to one of the water treatment facilities located at Mine Field A and Rockeye. Enough retention capacity will be maintained to allow for unexpected rainfall events. Evaporation will be the preferred method of decreasing retention pond volumes, but analyses of retained water shall be kept current so that water may be discharged when needed. A stormwater discharge permit will be obtained for discharge to the local drainage swales.

#### 4.1.10 Bioremediation Facility Site Restoration

MK demobilization of the site facilities will occur at the conclusion of the first year of full scale operation. It is assumed that the elements of demobilization described in this section may change by the time the project is concluded in order to be consistent with the needs of NSWC Crane for continued full scale soil bioremediation or reuse of the facility for other purposes. For the purpose of this Work Plan, it will be assumed NSWC Crane will continue to use the facility for purposes other than soil treatment.

#### 4.1.10.1 Equipment And Materials

Upon completion of the project, all remaining composting amendment materials will be used as topsoil amendments or transported to the onsite landfill for disposal. All soil/amendment mixtures shall complete their compost cycles and be transported to the onsite landfill for use as daily cover.

All equipment used in the bioremediation facility or at the excavation sites will be thoroughly decontaminated prior to leaving the site. Each piece of equipment will be brushed clean of any loose dirt or compost material prior to entering the truck wash area at the Bioremediation Facility exit. Once inside the truck wash station, the equipment will undergo a thorough cleaning with a high pressure low volume water spray. All wheels, wheel wells, vehicle undercarriages, truck beds, loader buckets, etc.. will be pressure washed and visually inspected for cleanliness. The washing process will be repeated if necessary.

#### 4.1.10.2 Project Facilities

The office trailers, laboratory and shower trailers, and supplies shall be removed from the site. All hand tools, sampling equipment, and instrumentation which has come in contact with potentially contaminated soil or compost will be decontaminated prior to leaving the site.

Once all equipment and vehicles have been decontaminated, the truck wash facility itself will be pressure washed and decontaminated. All decontamination fluids will be collected in the truck wash facility sump and sampled for analysis and disposal. A more detailed procedure is provided in the Operational Plan.

The interior surfaces of each building will be pressure spray washed and wipetested for explosives as described in the Operational Plan. A scissors-jack or utility truck may be required to reach surfaces above floor level. Decontamination fluids will be collected in the building sumps and sampled for analysis and disposal. Additional cleaning of the buildings will be implemented as required based on results of the wipe-test analysis.

The asphalt surface will be pressure washed and wipe tested in the same manner as the truck wash and compost buildings. All wash fluids will be collected in the stormwater retention ponds, sampled and disposition for disposal.

The asphalt pad, buildings, truck wash facility, stormwater retention ponds, utilities and sumps will be left in tact for NSWC Crane use.

#### 4.2 SWMU #03/10 - AMMUNITION BURNING GROUND

#### 4.2.1 Work Scope

The scope of work includes excavating and transporting explosives contaminated soils to the bioremediation facility, and regrading or backfilling and restoring the excavated area. Figure 4-1 shows the general layout of the site.

#### 4.2.2 Site Assessment

The NSWC Crane Site Representative will determine if a UXO survey is necessary. If the potential exists for encountering explosive ordnance in the work area, NSWC Crane will perform a surface UXO survey to identify and remove any unexploded ordnance. The area to be excavated will be surveyed and located in relationship to existing survey monuments. An Environmental Condition Report will be prepared documenting the conditions of the site prior to any remediation activities. Data will also be collected to create a topographical map of the site and to verify the quantities of material to be excavated. Permits will be obtained for all site activities and mobilization will begin. Preliminary information indicates that a maximum of 60,000 bank cubic yards (in-place cubic yards measured prior to excavation) of contaminated soil is to be excavated, and treated.

#### 4.2.3 Mobilization

The first step in mobilization will be to define the work area configuration. The work area configuration is composed of the Exclusion Zone (EZ) boundary, the Contamination Reduction Zone (CRZ) with appropriate decontamination stations, the Support Zone (SZ), and access routes. After the work area configuration is defined, the work zones and access routes will be established. Tools, equipment, and supplies will be delivered to the site and the personnel mobilized.

The general condition of the equipment will be inspected and tested to ensure that all safety systems and alarms are functional. The performance of the equipment will be tested to determine if the equipment can perform the required tasks.

#### 4.2.4 Excavation of Contaminated Soil

#### 4.2.4.1 Areas of Excavation

Excavation of contaminated soil will begin after completion of the site assessment. A maximum of 60,000 bank cubic yards of explosives-contaminated soil will be remediated to levels below those specified in the Pilot Scale Test Program.

The extent of contaminated soils at the ABG was estimated. For this delineation, contamination was defined as total explosives concentration exceeding a 10 mg/kg level and total lead and cadmium concentrations exceeding 500 mg/kg and 10 mg/kg levels respectively.

The total explosives level greater than 10 mg/kg concentration contour was developed from surface and boring samples from 0 to 30 inches in depth and is shown in Figure 4-2a. Total explosives level greater than 10 mg/kg concentration in soils from 30 to 90 inches in depth are shown in Figure 4-2c.(ACOE 1995)

The estimated extent of ABG soils that contain greater than 10 mg/kg cadmium or greater than 500 mg/kg lead are shown on Figure 4-2b for soils from 0 to 30 inches in depth and on Figure 4-2c for soils from 30 to 90 inches in depth.(ACOE 1995)

The area of soil for both the metals and explosives contaminated soil from 0 to 30 inches in depth is about 478,513 square feet (10.98 acres) which yields 44,307 cubic yards, assuming all the soil in the 30 inch depth is contaminated. For the 30 to 90 inch sample depths, the area of contamination was 86,472 (1.99 acres) square feet which equates to 16,013 cubic yards, assuming all the soil in the defined area between 30 and 90 inches is contaminated.(ACOE 1995)

Affected soil will be screened at the excavation site to remove oversize material (1½" or larger) from the soil prior to transport to the Bioremediation Facility for composting. The excavated soil will be loaded into the soil screening equipment using the backhoe/loader. The screening will be performed using a screen with a

minimum 50 ton/hr capacity. The screen will be a standard design, portable, road legal for towing, self-powered, and shall have a feed hopper with grizzly bars, fines stacking conveyor and an overs discharge conveyor. After screening, the fines shall be dropped from the fines stacking conveyor into a stockpile, or directly into a truck bed for transport to the Bioremediation Facility in covered trucks.

Prior to leaving the excavation site, all truck wheels and wheel wells will be decontaminated using a spray wash system as described in Section 7.4. Loose soil on the truck bed exterior will be broomed or brushed off and the truck bed containing excavated soil will be covered with tarp. The rinse water shall be collected and transported to the compost buildings for recycling on the compost windrows.

The screened soil will be transported to the bioremediation facility for treatment as described in the Operational Plan. If field screening results show that detectable levels of contaminants are below the remediation goals defined in the pilot scale tests, the soil will be segregated and stockpiled for reuse as fill or topsoil at ABG.

#### 4.2.4.2 Erosion Control And Collected Groundwater

As defined in 327 IAC 15-3-2 and 15-5-5, the Indiana Department of Environmental Management (IDEM) requires an Erosion Control Plan (ECP) to be submitted and approved for areas affected by construction greater than five acres. Therefore, since the area of excavation is projected to be nearly 11 acres, an ECP will be generated and submitted to the NSWC Resident Officer In Charge of Construction (ROICC) for IDEM approval prior to beginning construction at ABG.

Erosion control measures are of particular concern at the Ammunition Burning Grounds because of the proximity of the area to Little Sulphur Creek. Because of concern about erosion into the creek itself, Best Management Practices (BMPs) will be implemented as follows:

- The excavation will be phased to ensure that sources for potential sediment erosion into the stream will be minimized.
- Each area will be carefully controlled with appropriate BMPs until that area of excavation has been stabilized.
- The next phase will be started only if the previous area is completely controlled.

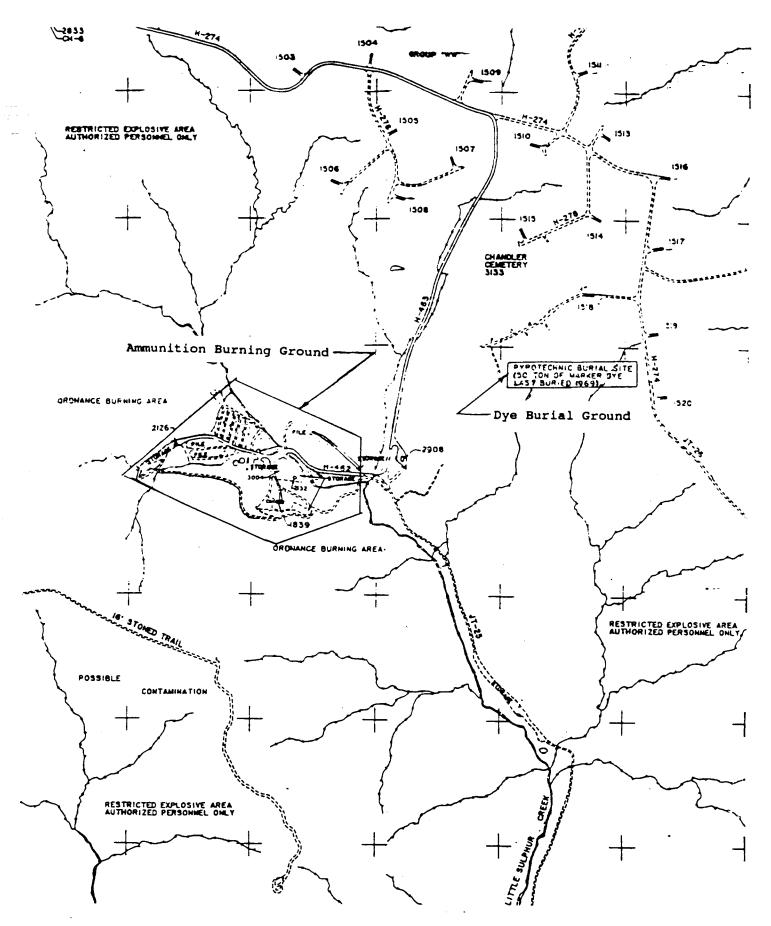


Figure 4-1 SWMU #03/10 Ammunition Burning Ground Location Map

- The phases of excavation will proceed from the high areas down to the stream bank.
- The phases of excavation will proceed from upstream areas to downstream areas.
- Berming will be established where necessary at the excavation boundaries to limit run-on.
- Secondary sediment barrier will be established along the edge of the creek during phases of excavation which could potentially impact a creek section at points where water is either present or likely to be present in the creek.
- Particular care will be taken with excavations which directly adjoin the creek.
- Excavation will not take place during periods when runoff is likely because of ongoing heavy precipitation.

Geotextile silt fences will be the primary erosion control device. Straw bales, properly installed, may only be used over short periods of time in isolated areas which are both separated from the creek by undisturbed areas and below which the creek reach is dry. Silt fences will be inspected regularly throughout the phased excavation. All silt fences will be installed in accordance with manufacturers recommendations.

Storm water that may collect in the area of the excavation will be containerized and sampled for disposition. All clean water will be utilized for dust control in the excavation areas or placed in a small solar evaporation pond. Based on sample results, contaminated water may be disposed of off-site as a hazardous waste; sent to the Rockeye treatment facility; disposed of in the site's sewage treatment system, if it meets the acceptance criteria; or used to moisten soil at the bioremediation facility.

#### 4.2.5 Soil Sampling and Analysis

The purpose of sampling at ABG is to delineate for the Navy the extent of contamination during excavation and to quantify the levels of contamination, if any, which remain after the excavation of the 60,000-cubic-yard maximum. Soil containing the constituents of concern at concentrations above the cleanup levels will be removed.

A detailed description of the excavation site sampling for delineating the extent of contamination as well as confirmation sampling is provided in the Operational Plan and the Bioremediation Facility Quality Assurance Project Plan (QAPP).

#### 4.2.6 Site Cleanup

As equipment is no longer required in the EZ it will be decontaminated and moved to the SZ. After all contaminated materials are containerized, the remaining equipment will be decontaminated and moved to the SZ. The decontamination equipment will then be cleaned and the work zone barriers removed. All decontamination fluids will be collected, sampled and either disposed at the sewage treatment plant, at an off-site facility, the Rockeye treatment facility, or used to moisten the compost at the Bioremediation Facility.

#### 4.2.7 Backfilling and Site Restoration

The extent of any excavation and the points at which confirmation samples were taken will be surveyed to determine the volume of the excavation, to record the extent of the excavation, and to record the location of the confirmation samples. The excavation will then be backfilled to grade with non-contaminated fill from the on-site or off-site borrow source.

The backfill will be placed in 12-inch lifts and compacted to the requirements of the Testing Plan and Log found in the QCP. Excavated areas will be covered with three inches of topsoil (defined as having a minimum of five percent organic matter), seeded with native grasses and fertilized. Erosion control measures will be maintained until the growth of grasses is sufficient to prevent erosion. Site restoration activities will be phased to coincide with erosion control measures.

Depending on the existing topography, backfilling may not be required should regrading of the area provide the necessary restoration contours for revegitation and surface water control.

#### 4.3 SWMU #10/15 - ROCKEYE MUNITIONS

#### 4.3.1 Work Scope

The scope of work includes excavating and transporting explosives contaminated soils to the bioremediation facility, and backfilling and restoring the excavated area with non-contaminated backfill. Figure 4-3 shows the general layout of the Rockeye site.

#### 4.3.2 Site Assessment

The NSWC Crane Site Representative will determine if a UXO survey is necessary. If the potential exists for encountering explosive ordnance in the work area, NSWC Crane will perform a surface UXO survey to identify and remove any unexploded ordnance. The area to be excavated will be surveyed and located in relationship to existing survey monuments. An Environmental Condition Report will be prepared documenting the conditions of the site prior to any remediation activities. Data will also be collected to create a topographical map of the site and to verify the quantities of material to be excavated. Permits will be obtained for all site activities and mobilization will begin. Preliminary information indicates that a maximum of 18,000 bank cubic yards of contaminated soil is to be excavated and treated.

### 4.3.3 Mobilization

The first step in mobilization will be to define the work area configuration. The work area configuration is composed of the EZ boundary, the CRZ with appropriate decontamination stations, the SZ, and access routes. After the work area configuration is defined, the work zones and access routes will be established. Tools, equipment, and supplies will be delivered to the site and the personnel mobilized.

The contractor will inspect the equipment for the presence of dirt, oils, and grease. The general condition of the equipment will be inspected and tested to ensure that all safety systems and alarms are functional. The performance of the equipment will be tested to determine if the equipment can perform the required tasks.

Storm water and erosion control measures will be implemented as necessary to control storm water runoff and to prevent erosion. These measures are explained further in the Environmental Protection Plan. The Rockeye excavation area will not exceed five acres and therefore does not require an Erosion Control Plan to be submitted and approved by IDEM.

### 4.3.4 Excavation of Contaminated Soil

After completion of the site assessment and the establishment of the work area configuration, the removal of contaminated soil can begin.

Affected soil will be screened at the excavation site to remove oversize material (1½" or larger) from the soil prior to transport to the Bioremediation Facility for composting. The excavated soil will be loaded into the soil screening equipment using the backhoe/loader. The screening will be performed using a screen with a minimum 50 ton/hr capacity. The screen will be a standard design, portable, road legal for towing, self-powered, and shall have a feed hopper with grizzly bars, fines stacking conveyor and an overs discharge conveyor. After screening, the fines shall be dropped from the fines stacking conveyor into a stockpile, or directly into a truck bed for transport to the Bioremediation Facility in covered trucks.

Prior to leaving the excavation site, all truck wheels and wheel wells will be decontaminated using a spray wash system as described in Section 7.4. Loose soil on the truck bed exterior will be broomed or brushed off and the truck bed containing excavated soil will be covered with tarp. The rinse water shall be collected and transported to the compost buildings for recycling on the compost windrows.

The screened soil will be transported to the bioremediation facility for treatment as described in the Operational Plan. If field screening results show that detectable levels of contaminants are below the remediation goals defined in the pilot scale tests, the soil will be segregated and stockpiled for reuse as fill or topsoil at Rockeye.

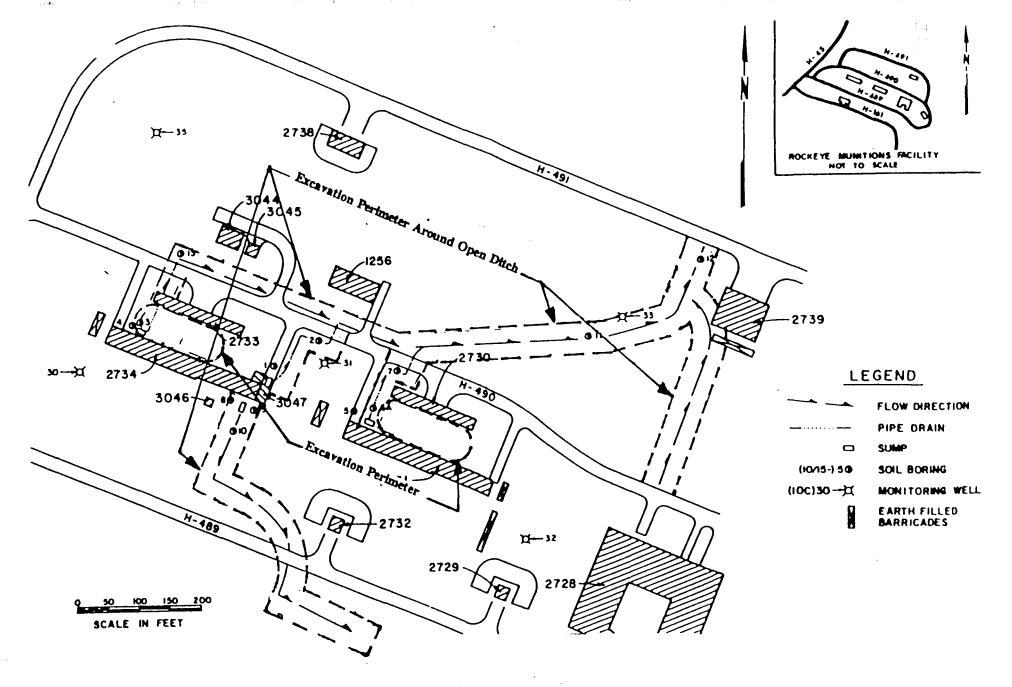


Figure 4-3
SWMU #10/15 Rockeye Munitions Soil Excavation Areas

Storm water that may collect in the area of the excavation will be containerized and sampled for disposition. All clean water will be utilized for dust control in the excavation areas or placed in a small solar evaporation pond. Based on sample results, contaminated water may be disposed of off-site as a hazardous waste; sent to the Rockeye treatment facility; disposed of in the site's sewage treatment system, if it meets the acceptance criteria; or used to moisten soil at the bioremediation facility.

### 4.3.5 Soil Sampling and Analysis

The purpose of the soil sampling effort in the Rockeye area is to determine the levels of contamination, if any, which may remain after the excavation of the 18,000-cubic-foot maximum. Soil containing the constituents of concern at concentrations above the cleanup levels defined in the pilot scale testing will be removed. A detailed description of the excavation site sampling for delineating the extent of contamination as well as confirmation sampling is provided in the Operational Plan and the Bioremediation Facility Quality Assurance Project Plan (QAPP).

### 4.3.6 Site Cleanup

As equipment is no longer required in the EZ it will be decontaminated and moved to the SZ. After all contaminated materials are containerized, the remaining equipment will be decontaminated and moved to the SZ. The decontamination equipment will then be cleaned and the work zone barriers removed. All decontamination fluids will be collected, sampled and either disposed at the sewage treatment plant, at an off-site facility, the Rockeye treatment facility, or used to moisten the compost at the Bioremediation Facility.

### 4.3.7 Backfilling and Site Restoration

The extent of any excavation and the points at which confirmation samples were taken will be surveyed to determine the volume of the excavation, to record the extent of the excavation, and to record the location of the confirmation samples. The excavation will then be backfilled to grade with non-contaminated fill from an on-site or off-site borrow source or composted material from the bioremediation facility.

The backfill will be placed in 12-inch lifts and compacted to the requirements of the Testing Plan and Log found in the QCP. Excavated areas will be covered with three inches of topsoil (defined as having a minimum of five percent organic matter), seeded with native grasses and fertilized. Erosion control measures will be maintained until the growth of grasses is sufficient to prevent erosion.

### 4.4 SWMU #12/14 - MINE FILL A

### 4.4.1 Work Scope

The scope of work includes excavating and transporting explosives contaminated soils to the bioremediation facility, and backfilling and restoring the excavated area with non-contaminated backfill or composted soils from the bioremediation facility. Figure 4-4 shows the general layout of the site.

### 4.4.2 Site Assessment

The NSWC Crane Site Representative will determine if a UXO survey is necessary. If the potential exists for encountering explosive ordnance in the work area, NSWC Crane will perform a surface UXO survey to identify and remove any unexploded ordnance. The area to be excavated will be surveyed and located in relationship to existing survey monuments. An Environmental Condition Report will be prepared documenting the conditions of the site prior to any remediation activities. Data will also be collected to create a topographical map of the site and to verify the quantities of material to be excavated. Permits will be obtained for all site activities and mobilization will begin. Preliminary information indicates that a maximum 11,000 bank cubic yards of contaminated soil is to be excavated and treated (MK 1994).

#### 4.4.3 Mobilization

The first step in mobilization will be to define the work area configuration. The work area configuration is composed of the EZ boundary, the CRZ with appropriate decontamination stations, the SZ, and access routes. After the work area configuration is defined, the work zones and access routes will be established. Tools, equipment, and supplies will be delivered to the site and the personnel mobilized.

Contractor will inspect the equipment for the presence of dirt, oils, and grease. The general condition of the equipment will be inspected and tested to ensure that all safety systems and alarms are functional. The performance of the equipment will be tested to determine if the equipment can perform the required tasks.

Storm water and erosion control measures will be implemented as necessary to control storm water runoff and to prevent erosion. These measures are explained further in the Environmental Protection Plan.

### 4.4.4 Excavation of Contaminated Soil

After completion of the site assessment, the removal of contaminated soil can begin. Excavation at this site includes:

- A 200-foot diameter, 3-foot deep excavation around each of the two receiving buildings.
- Four earthen blow-out retaining walls for each of the two Mine Fill buildings.
   The walls are approximately 15 feet high with a 1.5V to 1H slope. Each wall contains an estimated 500 cubic yards of soil.

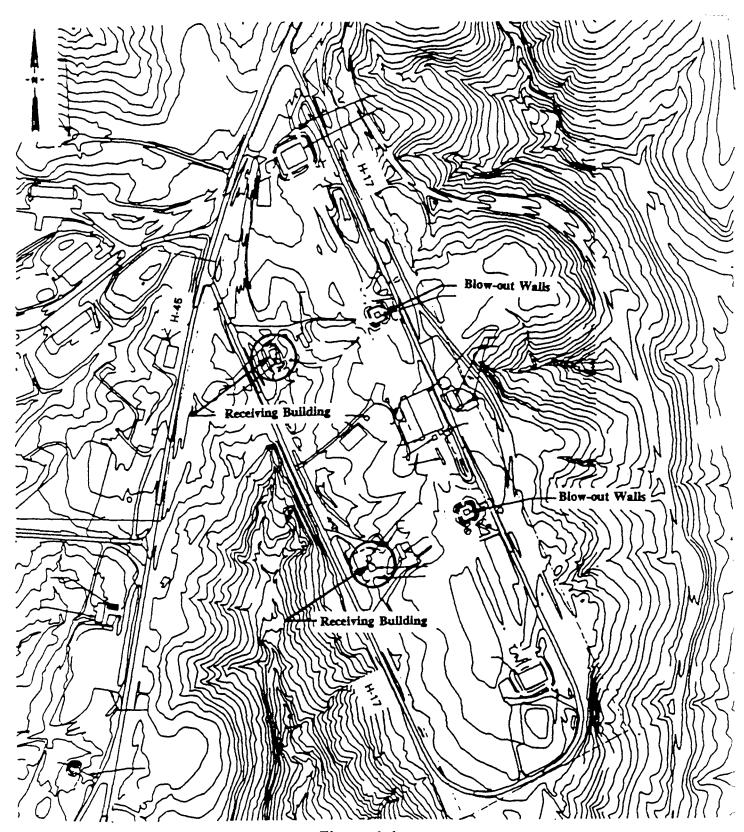


Figure 4-4 SWMU #12/14 Mine Fill A Soil Excavation Area

Affected soil will be screened at the excavation site to remove oversize material (1½" or larger) from the soil prior to transport to the Bioremediation Facility for composting. The excavated soil will be loaded into the soil screening equipment using the backhoe/loader. The screening will be performed using a screen with a minimum 50 ton/hr capacity. The screen will be a standard design, portable, road legal for towing, self-powered, and shall have a feed hopper with grizzly bars, fines stacking conveyor and an overs discharge conveyor. After screening, the fines shall be dropped from the fines stacking conveyor into a stockpile, or directly into a truck bed for transport to the Bioremediation Facility in covered trucks.

Prior to leaving the excavation site, all truck wheels and wheel wells will be decontaminated using a spray wash system as described in Section 7.4. Loose soil on the truck bed exterior will be broomed or brushed off and the truck bed containing excavated soil will be covered with tarp. The rinse water shall be collected and transported to the compost buildings for recycling on the compost windrows.

The screened soil will be transported to the bioremediation facility for treatment as described in the Operational Plan. If field screening results show that detectable levels of contaminants are below the remediation goals defined in the pilot scale tests, the soil will be segregated and stockpiled for reuse as fill or topsoil at Mine Fill A.

Storm water that may collect in the area of the excavation will be containerized and sampled for disposition. All clean water will be utilized as dust control in the excavation areas or placed in a small solar evaporation pond. Based on sample results, contaminated water may be disposed of at the Mine Fill A carbon treatment unit; disposed of in the site's sewage treatment facility, if it meets the acceptance criteria; or used to moisten soils at the bioremediation facility.

The soil bank around the blow-out walls will be backfilled as soon as possible, after soil removal, with non-contaminated backfill from the borrow source.

### 4.4.5 Soil Sampling and Analysis

The purpose of the soil sampling effort at Mine Fill A is to determine the levels of any contamination which may remain after the excavation of the maximum 11,000 cubic yards. Soil containing the constituents of concern at concentrations above the cleanup levels defined in the pilot scale testing will be removed. A detailed description of the excavation site sampling for delineating the extent of contamination as well as confirmation sampling is provided in the Operational Plan and the Bioremediation Facility Quality Assurance Project Plan (QAPP).

### 4.4.6 Site Cleanup

As equipment is no longer required in the EZ it will be decontaminated and moved to the SZ. After all contaminated materials are containerized, the remaining equipment will be decontaminated and moved to the SZ. The decontamination equipment will then be cleaned and the work zone barriers removed. All decontamination fluids will be collected, sampled and either disposed at the sewage treatment plant, at an off-site

facility, the Mine Fill A treatment facility, or used to moisten the compost at the Bioremediation Facility.

### 4.4.7 Backfilling and Site Restoration

The extent of any excavation and the points at which confirmation samples were taken will be surveyed to determine the volume of the excavation, to record the extent of the excavation, and to record the location of the confirmation samples. The excavation will then be backfilled to grade with non-contaminated fill from an on-site or off-site borrow source or composted material from the bioremediation facility.

The backfill will be placed in 12-inch lifts and compacted to the requirements of the Testing Plan and Log found in the QCP. Excavated areas will be covered with three inches of topsoil (defined as having a minimum of five percent organic matter), seeded with native grasses and fertilized. Erosion control measures will be maintained until the growth of grasses is sufficient to prevent erosion.

### 4.5 SWMU #13/14 - MINE FILL B

### 4.5.1 Work Scope

The scope of work includes excavating and transporting explosives contaminated soil, and backfilling and restoring the excavated area with non-contaminated backfill and soil. Figure 4-5 shows the general layout of the site.

### 4.5.2 Site Assessment

The NSWC Crane Site Representative will determine if a UXO survey is necessary. Ig the potential exists for encountering explosive ordnance in the work area, NSWC Crane will perform a surface UXO survey to identify and remove any unexploded ordnance. The area to be excavated will be surveyed and located in relationship to existing survey monuments. An Environmental Condition Report will be prepared documenting the conditions of the site prior to any remediation activities. Data will also be collected to create a topographical map of the site and to verify the quantities of material to be excavated. Permits will be obtained for all site activities and mobilization will begin. Preliminary information indicates that an estimated 22,000 bank cubic yards of contaminated soil is to be excavated and treated (MK 1994).

### 4.5.3 Mobilization

The first step in mobilization will be for the subcontractor to define the work area configuration. The work area configuration is composed of the EZ boundary, the CRZ with appropriate decontamination stations, the SZ, and access routes. After the work area configuration is defined, the work zones and access routes will be established. Tools, equipment, and supplies will be delivered to the site and the personnel mobilized.

Contractor will inspect the equipment for the presence of dirt, oils, and grease. The general condition of the equipment will be inspected and tested to ensure that all safety

systems and alarms are functional. The performance of the equipment will be tested to determine if the equipment can perform the required tasks.

Storm water and erosion control measures will be implemented as necessary to control storm water runoff and to prevent erosion. These measures are explained further in the Environmental Protection Plan.

#### 4.5.4 Excavation of Contaminated Soil

After completion of the site assessment, the removal of contaminated soil can begin. Excavation at this site includes:

- A 200-foot diameter, 3-foot deep excavation around each of the four receiving buildings.
- Four earthen blow-out retaining walls for each of the two Mine Fill buildings. The walls are approximately 15 feet high with a 1.5V to 1H slope. An estimated 500 cubic yards of soil are in each wall.

Affected soil will be screened at the excavation site to remove oversize material (1½" or larger) from the soil prior to transport to the Bioremediation Facility for composting. The excavated soil will be loaded into the soil screening equipment using the backhoe/loader. The screening will be performed using a screen with a minimum 50 ton/hr capacity. The screen will be a standard design, portable, road legal for towing, self-powered, and shall have a feed hopper with grizzly bars, fines stacking conveyor and an overs discharge conveyor. After screening, the fines shall be dropped from the fines stacking conveyor into a stockpile, or directly into a truck bed for transport to the Bioremediation Facility in covered trucks.

Prior to leaving the excavation site, all truck wheels and wheel wells will be decontaminated using a spray wash system as described in Section 7.4. Loose soil on the truck bed exterior will be broomed or brushed off and the truck bed containing excavated soil will be covered with tarp. The rinse water shall be collected and transported to the compost buildings for recycling on the compost windrows.

The screened soil will be transported to the bioremediation facility for treatment as described in the Operational Plan. If field screening results show that detectable levels of contaminants are below the remediation goals defined in the pilot scale tests, the soil will be segregated and stockpiled for reuse as fill or topsoil at Mine Fill B.

The soil bank around the blow-out walls will be backfilled as soon as possible, after soil removal, with non-contaminated backfill from the borrow source.

Storm water that may collect in the area of the excavation will be containerized and sampled for disposition. All clean water will be utilized as dust control in the excavation areas or placed in a small solar evaporation pond. Based on sample results, contaminated water may be disposed of off-site as a hazardous waste; disposed of in the site's sewage treatment system, if it meets the acceptance criteria; sent to the Mine Fill A treatment facility; or used to moisten soils at the bioremediation facility.

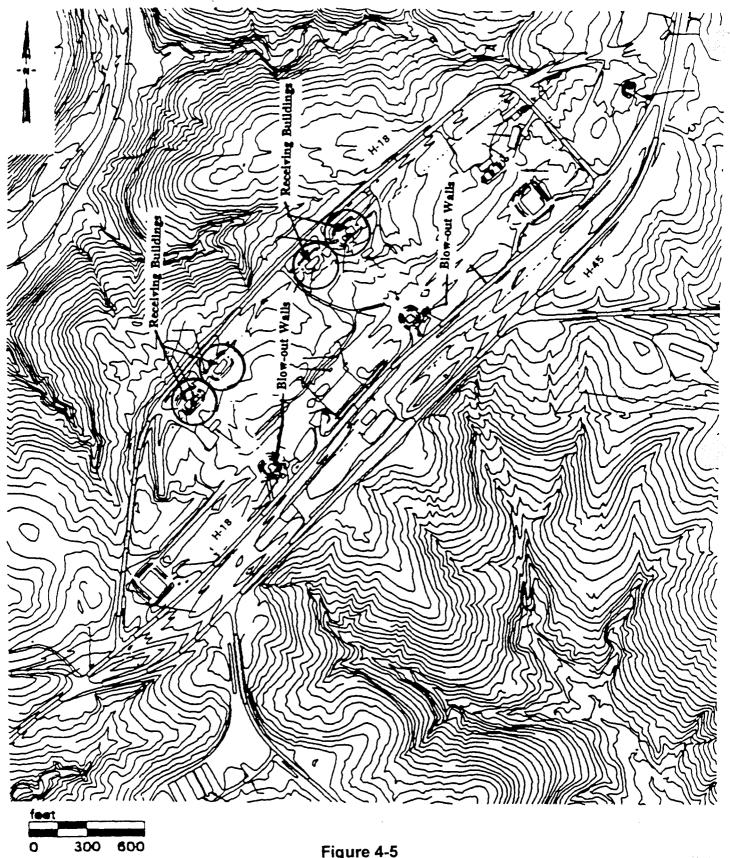


Figure 4-5
SWMU #13/14 Mine Fill B Soil Excavation Area

### 4.5.5 Soil Sampling and Analysis

The purpose of the soil sampling effort at Mine Fill B is to determine the levels of contamination, if any, which may remain after excavation described above. Soil containing the constituents of concern at concentrations above the cleanup levels defined in the pilot scale testing will be removed. A detailed description of the excavation site sampling for delineating the extent of contamination as well as confirmation sampling is provided in the Operational Plan and the Bioremediation Facility Quality Assurance Project Plan (QAPP).

### 4.5.6 Site Cleanup

As equipment is no longer required in the EZ it will be decontaminated and moved to the SZ. After all contaminated materials are containerized, the remaining equipment will be decontaminated and moved to the SZ. The decontamination equipment will then be cleaned and the work zone barriers removed. All decontamination fluids will be collected, sampled and either disposed at the sewage treatment plant, at an off-site facility, the Mine Fill A treatment facility, or used to moisten the compost at the Bioremediation Facility.

### 4.5.7 Backfilling and Site Restoration

The extent of any excavation and the points at which confirmation samples were taken will be surveyed to determine the volume of the excavation, to record the extent of the excavation, and to record the location of the confirmation samples. The excavation will then be backfilled to grade with non-contaminated fill from an on-site or off-site borrow source or composted material from the bioremediation facility.

The backfill will be placed in 12-inch lifts and compacted to the requirements of the Testing Plan and Log found in the QCP. Excavated areas will be covered with three inches of topsoil (defined as having a minimum of five percent organic matter), seeded with native grasses and fertilized. Erosion control measures will be maintained until the growth of grasses is sufficient to prevent erosion.

### 5.0 QUALITY CONTROL

As prime contractor, MK will implement and retain full authority of the Quality Control Plan (QCP) for this project. The QCP is bound under separate cover and is to be used in conjunction with this Work Plan. MK will manage all matters involving Quality Control performed in the execution of NAVFAC Delivery Orders. This approach provides the Navy with a quality management system having clear lines of authority and responsibility, and a consistent approach and application of quality requirements.

The QCP identifies quality testing and inspection requirements for the scope of work to be performed. To supplement the information contained therein, Appendix A of this Work Plan provides Field Inspection Checklists for general and specific items when performing inspections.

### 6.0 SAFETY AND HEALTH

The Task-Specific Site Safety and Health Plan (SSHP) for this Work Plan is specific to interim measures cleanup activities for SWMUs #03/10, #10/15, #12/14, #13/14, and the Soils Bioremediation Facility. The SSHP is a supplement to this Work Plan. All details in the SSHP are to be strictly followed during the execution of the work.

### 7.0 DECONTAMINATION ACTIVITIES

### 7.1 MINIMIZATION OF CONTAMINATION

During site activities, all personnel shall minimize contact with contaminated materials to keep "clean" during site activities. All personnel should minimize kneeling, splashing, and inadvertent physical contact with contaminated materials. Field procedures will be developed to control overspray and runoff and to ensure that unprotected personnel working nearby are not affected.

Entrance to the exclusion zones will be limited to personnel trained in accordance with 29 CFR 1910.120. The level of protection worn within each exclusion zone will be specified by the Site Safety and Health Officer (SSHO). Selection of personal protective equipment and anticipated levels of protection are summarized in Tables 5 and 6 of the SSHP. All personnel leaving the exclusion zone will pass through a decontamination zone and follow personnel decontamination procedures as specified in the SSHP.

### 7.2 DECONTAMINATION FACILITIES

Because of the distances between the different work areas, each SWMU shall have a designated decontamination facility. Before construction of each decontamination facility, soil samples shall be taken at the proposed location of the decontamination pad to establish the environmental conditions before interim measures cleanup activities begin.

Temporary personnel decontamination and shower/changeroom trailers will be provided in those areas designated by the SSHO. Each equipment decontamination facility shall be constructed of a single sheet of 60-mil high-density polyethylene (HDPE), sandbags, wood frame side walls and a container to collect decontamination water. The HDPE liner shall be placed over sand bedding material. The sides shall be constructed of the liner draped over sandbags. The decontamination facility shall be sloped to a sump or collection area. A single sheet of HDPE shall cover the base of the decontamination facility. If the ground is too soft to support the decontamination pad, plywood shall be used as a base for support. The decontamination facility shall be delineated with orange fencing or equivalent.

The liner will be visually inspected before use on a daily basis to detect possible failures of the liner material. The inspection process will consist of checking for the following:

- Evidence of tears and holes.
- Evidence of seepage.
- The sheeting is adequately fastened to the side walls.
- The liner adequately covers the sandbags at the end section.

If the liner is damaged, it will be repaired or replaced before further use of the facility. Soil beneath the liner in the area of the breach will be sampled.

Records will be maintained specifying facility construction material and methods, disposition of liquids and solids, daily inspections, and any repairs and/or breaches of liner integrity.

All decontamination fluids collected in the sump will be containerized at the end of each shift and sampled to determine disposal requirements. If precipitation is predicted, the decontamination pad will be covered to prevent accumulation of storm water.

After interim measures cleanup of a specific SWMU is completed, the decontamination facility will be dismantled. The materials from the facility are anticipated to be reused at another SWMU. If there is no indication of seepage, tears or holes, the HDPE liner will be thoroughly cleaned before being transported to another SWMU. Any decontamination facility materials that have been dispositioned as waste and are not reusable will be characterized and properly disposed of.

After the decontamination facility has been dismantled and removed, the underlying surface will be visually inspected. Visibly contaminated material will be removed and managed as a potentially affected material.

### 7.3 PERSONNEL DECONTAMINATION

Personnel will be required to pass through a decontamination area before exiting the exclusion zone. The personnel decontamination area will be located adjacent to the exclusion zone. The area will include, as required, a protective clothing removal area and container, respirator removal area and containers, storage for clean personnel protection equipment and clothing, wash station supplies for hands and face, and emergency showers for whole-body cleaning.

Before changing into street clothes, whole-body cleaning will be mandatory for personnel exiting areas as designated in the SSHP. The whole-body shower and change trailer will be provided at the Bioremediation Facility location.

All contaminated personal protective equipment and clothing shall be properly disposed of or cleaned and inspected for reuse. Field personnel decontamination procedures will be generated for these actions and will be monitored by the SSHO.

### 7.4 DECONTAMINATION OF HEAVY EQUIPMENT

Portions of construction and field equipment that have come into contact with any potentially contaminated material will be decontaminated. Heavy equipment, such as trucks and backhoes, will be cleaned by high-pressure water or steam. The equipment will be visually inspected for signs of contamination. If signs of contamination are still present, the cleaning procedures will be repeated until the criteria for cleanliness has been met. A more detailed description of equipment decontamination procedures is provided in the Operational Plan.

#### 7.5 **DECONTAMINATION OF SAMPLING EQUIPMENT**

Sampling equipment will be decontaminated per the manufacturer's instructions or as described in the QAPP.

### 8.0 WASTE MANAGEMENT

Waste management, including disposal functions, will be conducted in accordance with the project's Waste Management Plan (WMP) and all applicable regulations as specified in this Work Plan. The WMP is bound under separate cover and is to be used in conjunction with this Work Plan. However, NSWC Crane retains ownership of all wastes generated and is responsible for signing all waste manifests prepared for this project.

During field activities, various wastes will be generated including contaminated and noncontaminated ground and rain water, decontamination water, disposable personnel protective equipment, and inert wastes.

### 9.0 ENVIRONMENTAL PROTECTION

During site work, MK will employ measures to ensure protection of the environment. All site work will be performed in a manner that will minimize pollution of the air, water, and land. Environmental protection activities executed at the site will follow the Environmental Protection Plan and all applicable regulatory requirements. The EPP is bound under separate cover and is to be used in conjunction with this Work Plan. Care will be exercised to minimize the areas to be disturbed. An Environmental Condition Report will be prepared before interim measures cleanup activities at the site. The site will be restored, to the practical extent, to the original conditions documented in the Environmental Condition Report.

# 10.0 SCHEDULE

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### 11.0 REFERENCES

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# APPENDIX A INSPECTION ITEMS

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## MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental

**Procedure Type** 

Checklist Title		0.144.077.07.07.4	NE ADEA		Inspection Code	Revision Da	te	Checklist
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ITEM NO.	ITEM	CHECKED	A/R	INSPEC	CTION NUMBER/R	EMARKS		VERIFIED BY/ DATE
1	Are all containers l	abeled?				_		
2	Are any containers	bulging or leaking?						
3	Have containers/st on an impervious p	ockpiles been placed ad or area?						
4	Have all containers sampled?	/stockpiles been						
5	Are all stockpiles c	overed?						
6	Are run-on/run-off r	measures in place?			<u> </u>			
7	Are fluids from the being disposed of p	waste storage area properly?						
8	Is any waste nearing in the Waste Storage	g 90 days of storage ge Area?						
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Procedure Type

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1	Has a decontamina constructed in according	ntion area been ordance with the Work					
2	Are fluids used for contained at the de	decontamination contamination area?					
3	Are fluids disposed regular basis?	of properly on a					
4	Are run-on/run-off n	neasures in place?					
5		epage occurred since					
6	Is the containment repair (no holes, tea	system still in good ars or cracks)?					
7	Is the decontaminative repair?	tion area still in good					
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ITEM NO.	ITEM C	CHECKED	A/R	INSPEC	CTION NUMBER/	REMARKS		VERIFIED BY/ DATE		
1	Has an Environmen been prepared for ti	ital Condition Report ne area?						, <u> </u>		
2	Has an unexploded been completed?	ordnance survey								
3	Have the EZ, CRZ a	and SZ been defined				· —				
4	Have erosion contro in place?	ol measures been put		<u>.</u>						
5	Has the contractor the work submitted training records and certificates?	all required reps/certs,								
6	Have soil samples t	peen taken to define hination in the area?								
7	Have photographs tarea?	peen taken of the				·				
8	Is contractor equipment and has it been clear	nent in working order ined?								
9	Has a decontaminat constructed?	tion area been								
10	Have necessary per and have required n made?	mits been obtained otification been								
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ITEM NO.		HECKED	A/R IN	SPE	CTION NUMBER/F	<del></del>	T	VERIFIED BY/ DATE
1	is storm water or gre controlled and dispo	oundwater properly osed of?						
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4	Has contaminated s transported?	oil been properly						
5	Have photographs be remediation activities	peen taken of the						
6	Were daily logs and	reports made?					ĺ	
7	Has the decontamin inspected on a daily	ation facility been						
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### MORRISON KNUDSEN CORPORATION

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Checklist Title	GENERAL ITEMS-AFTER EXCA	VATION	1.	Inspection Code GI-03	Revision Date  JUNE 1		Checklist Page 3 of 3			
ITEM NO.	ITEM CHECKED	A/R	INSPEC	TION NUMBER/	REMARKS		VERIFIED BY/ DATE			
1	Has the excavation been backfilled with clean material which has been placed and compacted properly?									
2	Has topsoil been placed in disturbed areas?			_ <del>_</del>						
3	Have the disturbed areas been seeded?									
4	Has a general cleanup been done of the affected areas?		<u>.</u>							
5	Were photographs taken of the affected areas?									
6	Were soil erosion prevention measures left in place until vegetation grew?									
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Specific Item Id	fentification or Location, as applicable:				_					
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## MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental

### Procedure Type

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Checklist Title	BACKFIL	SOILS LL AND COMPACT Ammunition Burni			Inspection Code SO-01	JUNE 9		Page 1 of 2
ITEM NO.		HECKED	A/R	INSPE	CTION NUMBER/F	REMARKS		VERIFIED BY/ DATE
1	Confirm a soils repo to confirm soils type table.	rt has been generated s and depth of water	N/A					
2	Confirm work areas with the limits of wor (stakes, lines, monu	k clearly established						
3	Check that backfill n specifications (moist gradation).	naterials comply with ture, density,		_				
4	that are to remain ar	tect these items from ees, utility poles,						
5	Verify precautions as prevent/contain the salurry, etc. to assure base spill plan.	re taken to spillage of gas, oil, compliance with the						
6	Verify that shoring have required, and that promade for safety barro	as been approved, as ovisions have been icades.						
7	Verify that excavatio accordance with the established bounds.	n is performed in Work Plan and within						
8	Verify that sub-stand roots, etc.) are remo							
9	Verify that subsoil irr soft spots are remov	egularities such as ed.						
10	Confirm that drainage conforms with design	e, de-watering, etc., n/specs.						
11	Ensure that materials work are performed, in accordance with procedures, standard specifications. Requiremaintained.	inspected, and tested ne Work Plan, ds, and						
Specific Item to	dentification or Location, as ap	oplicable:				<del></del>		
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# MORRISON KNUDSEN CORPORATION

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Checklist Title SOILS					Inspection Code	Revision Dat	e	Checklist		
BACKFILL AND COMPACTION SWMU #03/10 - Ammunition Burning Ground					SO-01	JUN	≣ 96	Page 2 of 2		
ITEM NO.	TEM CHECKED A/P			INSPECTION NUMBER/REMARKS				VERIFIED BY/ DATE		
12	Verify the performa Proctor Tests for ea receipt of test repo	nnce of ASTM D698 ach soil type. Ensure rt by MK.								
13	Verify that backfill r compacted in lift thi exceed specificatio of lifts shall also be	icknesses that do not				-				
14	Verify performance and documentation	of Field Density Tests of results.								
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## MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental

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ITEM ITEM CHECKED			A/R	INSPE	ECTION NUMBER/REMARKS			VERIFIED BY/ DATE
1	Confirm a soils repo to confirm soils type table.	ort has been generated as and depth of water	N/A					
2	Confirm work areas with the limits of wo (stakes, lines, monu	rk clearly established						
3	that are to remain a	otect these items from ees, utility poles,						
4	Verify precautions a prevent/contain the slurry, etc. to assure base spill plan.	re taken to spillage of gas, oil, compliance with the						
5	Verify that shoring h required, and that pi made for safety barr							
6	Verify that excavation accordance with the established bounds.	Work Plan and within						
7	Verify that sub-stand roots, etc.) are remo	dard materials (tree						
8	Verify that subsoil irregularities such as soft spots are removed.				······································			
9	Confirm that drainage, de-watering, etc., conforms with design/specs.					<u> </u>		
10	in accordance with t procedures, standar	inspected, and tested he Work Plan,						
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# MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental

Procedure Type

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Checklist Title  SOILS  BACKFILL AND COMPACTION  SWMU #10/15 - Rockeye					Inspection Code SO-02	Revision Date		Page 2 of 2	
ITEM NO.	ITEM CHECKED A/R			INSPECTION NUMBER/REMARKS				VERIFIED BY/ DATE	
11	After an area has b confirm the area wa foundations are pro	as resurveyed so	N/A						
12	Confirm footing are	as are compacted.	N/A		_				
13	Check foundation e adequacy, bracing,	excavations for form clearance, etc.	N/A						
14	Confirm that footing manner specified.	drains are installed in	N/A						
15	Check that backfill specifications (mois gradation).	materials comply with sture, density,							
16	Verify the performal Proctor Tests for ea receipt of test repor	ich soil type. Ensure							
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18	Verify performance and documentation	of Field Density Tests of results.							
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SOILS BACKFILL AND COMPACTION SWMU #12/14 - Mine Fill A				SO-03	JUN	E 96	Page 1 of 2	
ITEM NO.	ITEM	CHECKED	A/R I	NSPEC	TION NUMBER/R	EMARKS	6	VERIFIED BY/ DATE
1		oort has been generated bes and depth of water	N/A					
2		s have been located ork clearly established numents).						
3	that are to remain a	rotect these items from trees, utility poles,						
4	Verify precautions prevent/contain the slurry, etc. to assur base spill plan.	are taken to e spillage of gas, oil, re compliance with the						
5	Verify that shoring required, and that pmade for safety bar	has been approved, as provisions have been pricades.						
6	Verify that excavati accordance with the established bounds	e Work Plan and within						
7	Verify that sub-stan	ndard materials (tree oved.						
8	Verify that subsoil i soft spots are remo	rregularities such as ved.						
9	Confirm that draina conforms with design	ge, de-watering, etc., gn/specs.				· · ·		
10	work are performed in accordance with procedures, standa							
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ITEM NO.	ITEM (	CHECKED	A/R	INSPEC	TION NUMBER	R/REMARKS	;	VERIFIED BY/ DATE
11	After an area has b confirm the area wa foundations are pro	as resurveyed so	N/A					
12	Confirm footing are	as are compacted.	N/A					
13	Check foundation e adequacy, bracing,	xcavations for form clearance, etc.	N/A					
14	Confirm that footing manner specified.	drains are installed in	N/A				_	
15	Check that backfill specifications (mois gradation).	materials comply with sture, density,						
16	Verify the performa Proctor Tests for ea receipt of test repor	ich soil type. Ensure						
17	Verify that backfill n compacted in lift thi exceed specification of lifts shall also be	cknesses that do not not not not not not not not not no						
18	Verify performance and documentation	of Field Density Tests of results.						
19	Ensure that final graph previous subgrade	ade of the backfill is to material				·		
20	been performed whe and documented. E	action measures have ere required, verified, Ensure clearance of he Rework Items List.						
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Checklist Title  SOILS  BACKFILL AND COMPACTION  SWMU #13/14 - Mine Fill B				Inspection Code SO-04	Revision Date	İ	Checklist Page 1 of ∠
ITEM NO.	ITEM CHECKED	A/R	INSPEC	CTION NUMBER/R	REMARKS	\	/ERIFIED BY/ DATE
1	Confirm a soils report has been generated to confirm soils types and depth of water table.	N/A					
2	Confirm work areas have been located with the limits of work clearly established (stakes, lines, monuments).		·				
3	Identify existing improvements and items that are to remain and verify arrangements to protect these items from damage (such as trees, utility poles, buildings, fences and piping, etc.)						
4	Verify precautions are taken to prevent/contain the spillage of gas, oil, slurry, etc. to assure compliance with the base spill plan.		,				
5	Verify that shoring has been approved, as required, and that provisions have been made for safety barricades.						
6	Verify that excavation is performed in accordance with the Work Plan and within established bounds.						
7	Verify that sub-standard materials (tree roots, etc.) are removed.						
8	Verify that subsoil irregularities such as soft spots are removed.						
9	Confirm that drainage, de-watering, etc., conforms with design/specs.			· · · · · · · · · · · · · · · · · · ·			
10	Ensure that materials, compaction, and work are performed, inspected, and tested in accordance with the Work Plan, procedures, standards, and specifications. Required reports shall be maintained.						
Specific Item Id	entification or Location, as applicable						
	Specific Item Identification or Location, as applicable						
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# MORRISON KNUDSEN CORPORATION Engineering, Construction, & Environmental

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Checklist Title	BACKFI	SOILS LL AND COMPACT J #13/14 - Mine Fill			Inspection Code SO-04	Revision Dat		Checklist Page 2 of 2
ITEM NO.			A/R	INSPEC	TION NUMBER	REMARKS		VERIFIED BY/ DATE
11	After an area has b confirm the area wa foundations are pro	as resurveyed so	N/A					
12	Confirm footing are	as are compacted.	N/A	_	· <del></del>			_
13	Check foundation e adequacy, bracing,	excavations for form clearance, etc.	N/A					
14	Confirm that footing manner specified.	drains are installed in	N/A					
15	Check that backfill specifications (mois gradation).	materials comply with sture, density,						
16	Verify the performa Proctor Tests for ea receipt of test repor	nce of ASTM D698 ach soil type. Ensure t by MK.			<del></del>			
17	Verify that backfill n compacted in lift thi exceed specification of lifts shall also be	icknesses that do not n. Compaction testing						
18	Verify performance and documentation	of Field Density Tests of results.						
19	Ensure that final graphers previous subgrade	ade of the backfill is to material						
20	been performed whe and documented. E	action measures have ere required, verified, Ensure clearance of the Rework Items List.				<del></del>		
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# APPENDIX B TECHNICAL SPECIFICATIONS

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## **TABLE OF CONTENTS**

## **SECTION**

02100	SITE CLEARING
02200	STRUCTURE EXCAVATION AND BACKFILLING
02275	MEMBRANE LINING SYSTEM
02513	ASPHALT CONCRETE PAVING
02936	SEEDING
03200	CONCRETE REINFORCEMENT
03300	CAST-IN-PLACE CONCRETE
13121	PRE-ENGINEERING
15100	CPVC UNDERGROUND PIPE

# SECTION 02100 SPECIFICATION FOR SITE CLEARING

#### PART 1 GENERAL

#### 1.1 Section Included

- A. Remove surface debris.
- B. Remove paving, curbs.
- C. Clear site of plant life and grass.
- D. Remove trees and shrubs.
- E. Remove root system of trees and shrubs.
- F. Relocate existing underground pipe.
- G. Erosion control.

#### 1.2 Related Sections

Section 02200

Structure Excavation and Backfilling

Section 15100

**CPVC Underground Pipe** 

#### 1.3 Regulatory Requirements

- A. Conform to applicable Federal, State, and Local codes for disposal of debris.
- B. Coordinate clearing work with utility companies.

#### PART 2 MATERIAL

2-1/2" diameter C.P.V.C Pipe shall be per Section 15100.

#### PART 3 EXECUTION

#### 3.1 <u>Preparation</u>

A. Verify that existing plant life and features designated to remain are tagged or identified.

#### 3.2 Protection

- A. Protect utilities that remain, from damage.
- B. Protect trees, plant growth, and features designated to remain as final landscaping.
- C. Protect bench marks and existing structures from damage or displacement.

#### 3.3 Clearing

- A. Clear areas required for access to site and execution of work.
- B. Remove paving and curbs.
- C. Remove trees and shrubs within marked areas. Remove stumps and root systems to a depth of 18 inches or as otherwise shown on the drawings.
- D. Clear undergrowth and deadwood without disturbing subsoil.
- E. Apply herbicide to remaining stumps to inhibit growth.

#### 3.4 Removal

- A. Remove debris, rock, and extracted plant life from site & dispose per owner's instructions.
- B. No burning of removed debris or plant life is permitted.

#### 3.5 Relocation

Relocate two existing, underground, P.V.C. Force Mains as shown on the Civil - Plot Plan (Dwg. No. C-001). Minimum depth below finished grade shall be 2'-6".

#### 3.6 Erosion Control

Submit proposed methods and details for erosion control procedures to the Contractor for approval before beginning excavation and clearing operations.

#### **END SECTION 02100**

#### **SECTION 02200** STRUCTURE EXCAVATION AND BACKFILLING

#### PART 1 **GENERAL**

#### 1.1 Section Includes

- Α. Excavation for building foundations.
- B. Excavation for slabs-on-grade and paving.
- C. Excavation for site structures.
- D. Building perimeter and site structure backfilling to subgrade elevations.
- E. Site filling and backfilling.
- F. Fill under slabs-on-grade and paving. Consolidation and compaction.
- G. Fill for over-excavation.

#### 1.2 **Related Sections**

Section 03300

Cast-in-Place Concrete

#### 1.3 Reference Standards (Latest Edition)

Α.	ASTM D422:	Particle

Particle Size Analysis of Soils ASTM D422:

B. **ASTM D424**: Test for Plastic Limit and Plasticity Index of

Soils

C. **ASTM D698:** Test Method for Laboratory Compaction

Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup> (600kN-m/m<sup>3</sup>))

D. Test Method for Density of Soil In-Place by ASTM D1556:

the Sand-Cone Method

Test Method for Laboratory Compaction E. **ASTM D1557:** 

Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup> (2,700kN-m/m<sub>3</sub>))

F. Test for Density of Soil In-Place by the **ASTM D2167**:

Rubber-Balloon Method

G. **ASTM D2487**: Classification of Soils for Engineering

**Purposes** 

Н. **ASTM D2922:** Test for Density of Soil and Soil-Aggregate

In-Place by Nuclear Methods (Shallow

Depth)

I. ASTM D4253:

Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory

Table

J. ASTM D4254:

Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of

Relative Density.

#### 1.4 Submittals

#### A. Dewatering

Submit proposed methods and details for dewatering procedures to the Contractor for approval before beginning excavation operations.

#### B. Samples

Submit representative samples of borrow soils two weeks prior to borrow source use.

#### C. Test Results

 Contractor shall be responsible for the testing of representative samples of borrow that the Subcontractor intends to use as fill or backfill.

#### 2. Tests shall consist of:

- a. Gradation
- b. Relative Density of Cohesionless Soils
- c. Moisture Density Curves per ASTM D698
- d. Soil Classification
- 3. All data to be submitted for approval.

#### D. Source

Submit source of supply for all material used in filling and backfilling for approval.

#### E. Field Density Tests

Field density test results shall be verbally reported to the Contractor as soon as they are available. Subsequent to verbal notification, formal documentation of the results shall be submitted to the Contractor within ten working days.

#### PART 2 PRODUCTS

#### 2.1 Materials

A. Suitable Borrow Material

- Suitable borrow materials shall include material classified using the Unified Soil Classification System as GW, GP, SW, SP, GM, GC, SM, SC, CL, CH, or as approved by the Engineer as per ASTM D422, D424 and D2487.
- Suitable borrow material shall be free of chemical contamination, debris, organic material, large stones and excess moisture that will prevent proper compaction.
- 3. Obtain suitable borrow material from offsite sources.

#### B. Select Borrow Material

- Select borrow material shall be soils of low expansion potential having a liquid limit of less than 40 and plasticity index below 15, as tested in accordance with ASTM D424. At least 12% of the material should pass a No. 200 sieve.
- 2. Select borrow material shall be free of chemical contamination, debris, organic material, large stones and excess moisture that will prevent proper compaction.
- 3. Obtain select borrow material from offsite sources.

#### C. Unsuitable Material

- 1. Unsatisfactory materials include materials classified using the Unified Soil Classification System as PT, OH, OL and materials of any classification that are determined by the Engineer as too wet for use in the backfilling operations.
- 2. Salt, sulfur, hydrocarbon or other chemically impregnated soils shall be considered unsuitable for reuse.

#### D. Borrow Clay

- Suitable borrow clay shall include material classified using the Unified Soil Classification System as CL, CH or any mixture of these per ASTM D422, D424 and D2487.
- 2. Suitable borrow clay shall be free of chemical contamination, debris, organic material, large stones and excess moisture that will prevent proper compaction.

#### E. Borrow Sand

1. Borrow sand for sandfill and backfill shall be sound, hard, durable, angular material meeting the following gradation requirements:

SIEVE (U. S. Standard)	PERCENT PASSING (by Weight)		
3/8"	100		
#4	95-100		
#40	12-60		
#200	0-12		

#### F. Borrow Limestone

1. Borrow limestone for structural backfill, shall be sound, hard, durable, angular particles meeting the following gradation requirements:

SIEVE (U. S. Standard)	PERCENT PASSING (by Weight)
2"	100
1"	60-90
3/8"	35-70
#4	25-60
#10	20-50
#30	10-50
#60	8-40
#200	5-10

- 2. The percent passing the No. 200 sieve shall be based on the weight of the sample passing the No. 4 sieve.
- 3. Borrow limestone for structural fill, levees and dikes, shall be sound, hard, durable, angular particles meeting the following gradation requirements:

SIEVE PERCENT (U. S. Standard)	PASSING (by Weight)
1-1/2"	95-100
3/4"	65-95
#4	0-15

## PART 3 <u>EXECUTION</u>

## 3.1 Preparation

- A. Identify required lines, levels, contours and datum.
- B. Identify known underground, above ground and aerial utilities. Stake and flag locations.
- C. Notify Contractor for removal and relocation of any utilities.

- D. Protect above and below grade utilities which are to remain.
- E. Protect plant life, lawns and other features remaining as a portion of final landscaping.
- F. Protect bench marks, existing structures, fences, sidewalks, paving and curbs from excavation equipment and vehicular traffic.
- G. Generally, compact subgrade to density requirements for subsequent backfill materials.
- H. Cut out soft areas of subgrade not capable of in-situ compaction. Backfill and compact to density equal to or greater than requirements for subsequent backfill materials.
- I. Prior to placement of aggregate base/subbase course material at paved areas, compact subsoil to 95 percent of its maximum dry density in accordance with ASTM D698.

#### 3.2 Examination

- A. Verify fill materials to be reused are acceptable.
- B. Verify foundation perimeter drainage installation has been inspected.

#### 3.3 Excavation

- A. All excavations shall be protected and guarded against danger to life and property and shall conform to OSHA "Construction Standard for Excavations" (29 CFR Part 1926.650-.652, Subpart P and EM 385-1-1). Permanent excavations or fill shall have retaining walls sufficient in strength to retain the embankment, together with any surcharge loads, unless the sides slope sufficiently for this retention.
- B. Excavate subsoil required to accommodate building foundations, paving and site structures and construction operations.
- C. Machine slope banks to angle of repose or less, until shored.
- D. Excavation cut not to interfere with normal 45° bearing splay of foundation.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation. Any water that does accumulate in an excavation during working hours shall be removed continuously or as a significant accumulation occurs. Overnight accumulation shall be removed immediately at the beginning of the work day. The Subcontractor shall provide temporary pumping facilities to drain the water to the nearest catch basin or drainage ditch.
- F. Hand trim excavation. Remove loose matter.
- G. Remove lumped subsoil, boulders and rock.

- H. Hand excavation shall be required around any below grade piping or other utilities. Support piping and other utilities which could be damaged by excavation work. Any piping or pipe coating that is damaged shall be repaired at the Subcontractor's expense.
- If underground obstructions, piping or other utility services are encountered which are not indicated on the drawings or in the specifications, instructions shall be obtained from the Contractor before proceeding.
- J. Notify Contractor of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- K. Correct unauthorized excavation at no extra cost to Contractor.
- L. Correct areas over-excavated by error by placing lean concrete or compacted approved backfill in the excavation to the correct elevation.
- M. Stockpile excavated material in area designated onsite and remove excess material not being reused from site.

#### 3.4 Backfilling

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement or proper compaction activities. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Granular Soils Fill

Place and compact materials in continuous layers not exceeding six inches compacted depth.

- D. Compact granular backfill to at least 95 percent of the Modified Proctor maximum density determined in accordance with ASTM D1557.
- E. Cohesive Soils Fill

Place and compact material in continuous layers not exceeding 8 inches compacted depth.

- F. Clayey sands and cohesive soils shall be placed and compacted to at least 95 percent of the Modified Proctor maximum density determined in accordance with ASTM D1557. Moisture content of the fill shall be controlled within ± 3 percent of optimum moisture.
- G. Upon placement and compaction of each lift of cohesive material, the surface shall be scarified to a depth of two inches prior to the placement of subsequent lift.
- H. Employ a placement method that does not disturb or damage foundations, perimeter drainage, foundation waterproofing and protective cover on utilities in trenches.

- I. Maintain optimum moisture content of backfill materials to attain required compaction density.
- J. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.
- K. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- L. Slope grade away from building minimum two inches in 10 feet, unless noted otherwise.
- M. Make grade changes gradual. Blend slope into level areas.
- N. Remove surplus backfill materials from site.
- O. Leave fill material stockpile areas completely free of excess fill materials.

#### 3.5 Tolerances

A. Top Surface of Backfilling

Plus or minus one inch from required elevations.

#### 3.6 Field Quality Control

- A. The Subcontractor shall conduct field density tests during backfill and fill placement. The tests shall be performed by qualified Soil Technicians working under the direction of a Soils Engineer registered in the state where the project is located.
- B. Field density tests shall be performed in accordance with ASTM D2922, D1556 or D2167.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Contractor.

#### D. Frequency of Tests

- 1. Every 50 cubic yards of fill or backfill in trenches or around structures.
- 2. Every 200 cubic yards for embankment, dike or other mass earthwork.
- 3. At least one test shall be made for every full day of compaction operations on mass earthwork.
- 4. One test whenever there is a definite change in the quality of moisture control or effectiveness of compaction.
- E. Proof roll compacted fill surfaces under slabs-on-grade paving.

#### 3.7 <u>Protection of Finished Work</u>

- A. Recompact fills subjected to vehicular traffic, erosion,or other fill surface disruptive activities.
- B. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- C. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

**END OF SECTION 02200** 

# SECTION 02275 MEMBRANE LINING SYSTEM

## PART 1 GENERAL

#### 1.1 Work Included

This specification section covers the minimum requirements for the standards, materials, installation, testing, acceptance and warranty for the HDPE (High Density Polyetheylene) and non-woven geotextile membrane lining system. The Installation Contractor shall provide all the materials, labor, supervision, tools, equipment, plant and testing for performance of all work to furnish, install and test the HDPE membrane lining system in accordance with the contract documents and as specified herein.

### 1.2 <u>Definitions</u>

- A. The term Owner and/or Engineer shall mean the Department of the Navy, Navy Surface Weapons Center, Crane, IN and its authorized Contracting Officer, agent and/or representative.
- B. The term Contractor and/or Construction Manager shall mean Morrison Knudsen Corporation and MK Corporation-Environmental Services.
- C. The term Subcontractor, Fabricator, Manufacturer, Vendor, Supplier, and/or Seller shall mean the party or parties providing and selling the materials, goods and/or services to the Contractor.

#### 1.3 Related Sections

Section 02200	Structure Excavation and Backfilling
Section 02223	Backfilling
Section 03300	Cast-In-Place Concrete
Section 15100	CPVC Underground Pipe

#### 1.4 Reference Standards

The following publications listed below form a part of this specification to the extent indicated by the reference thereto. Publications listed refer to the latest edition as of the issue date of this specification. The references are referred to in the text thereafter by basic designation only:

## A. American Society for Testing and Materials (ASTM):

1.	D 374	Thickness of Solid Electrical Insulation
2.	D 413	Rubber Property-Adhesion to Flexible Substrate
3.	D 570	Water Absorption of Plastics
4.	D 638	Tensile Properties of Plastics
5.	D 696	Coefficient of Linear Thermal Expansion of Plastics
6.	D 698	Test Method for Laboratory Compaction of Soil
		Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> ) (600 kN-
		$m/m^3$ )
7.	D 746	Brittleness Temperature of Plastics and Elastomers
		by Impact
8.	D 751	Coated Fabrics
9.	D 790	Flexural Properties of Unreinforced and Reinforced
		Plastics and Electrical Insulating Materials
10.	D 792	Specific Gravity (Relative Density) and Density of
	Plastics by [	Displacement
11.	D 882	Tensile Properties of Thin Plastic Sheeting
12.	D 1004	Initial Tear Resistance of Plastic Sheeting
13.	D 1149	Rubber Deterioration-Surface Ozone Cracking in a
		Chamber
14.	D 1203	Volatile Loss from Plastics Using Activated Carbon
		Method
15.	D 1204	Linear Dimensional Changes of Nonrigid
		Thermoplastic Sheeting or Film at Elevated
		Temperatures
16.	D 1238	Flow Rates of Thermoplastics by Extrusion
		Plastometer
17.	D 1505	Density of Plastics by the Density-Gravity
		Technique
18.	D 1557	Test Method for Laboratory Compaction
		Characteristics of Soil Using Modified Effort
		(56,000 ft-lbf/ft <sup>3</sup> ) (2,700 kN-m/m <sup>3</sup> )
19.	D 1593	Nonrigid Vinyl Chloride Plastic Sheeting
20.	D 1603	Carbon Black in Olefin Plastics
21.	D 1693	Environmental Stress-Cracking of Ethylene Plastics
22.	D 1777	Measuring Thickness of Textile Materials
23.	D 1822	Tensile-Impact Energy to Break Plastics and
		Electrical Insulating Materials

24.	D 2663	Standard Test Methods for Carbon Black Dispersion in Rubber
<b>25</b> .	D 2837	Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
26.	D 3015	Microscopical Examination of Pigment Dispersion in Plastic Compounds
27.	D 3083	Flexible Poly (Vinyl Chloride) plastic Sheeting for Pond, Canal, and Reservoir Lining
28.	D 3776	Mass Per Unit Area (Weight) of Woven Fabric
29.	D 3786	Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics-Diaphragm Bursting Strength Test Method
30.	D 3787	Bursting Strength of Knitted Goods - Constant- Rate-of-Transverse (CRT) Ball Burst Test
31.	D 3895	Oxidative Induction Time of Polyolefins by Thermal Analysis

#### B. National Sanitation Foundation (NSF):

1. Std 54 Flexible Membrane Liners

#### 1.5 Submittals

#### A. Manufacturer's Submittals:

The manufacturer shall submit and provide the following information for review and acceptance by the Contractor and the Engineer before commencement of the work:

- 1. Products must comply with the Buy America Act.
- 2. General manufacturing and production facility information and location(s).
- 3. Material properties and sample liner materials.
- 4. Manufacturer's QA/QC Manual.
- 5. Documentation list of not less than 20 retention ponds with secondary containment liner facilities supplied by the HDPE geomembrane lining manufacturer. Installation list shall have the following minimum information:
  - Client names and locations
  - Purpose of the facility and installation date

- Client Contact (facilities engineer, project manager, project engineer, design engineer, plant manager) and the current phone number
- The geomembrane mil thickness and the total square footage installed

#### 6. Installer Submittals:

The installer shall submit and provide the following information for review and acceptance by the Contractor and the Engineer before commencement of the work:

- 7. Brief company background and capabilities
- 8. Insurance coverage and certificates
- 9. Field installation Supervisor and Master Seamer personnel resumes
- 10. Installation, testing, repair and quality control procedures manual(s)
- 11. Installers QA/QC Manual
- 12. Documentation list of not less than 20 retention pond secondary containment liner facilities installed by the HDPE geomembrane lining installation Subcontractor. Installation list shall have the following minimum information:
  - Client names and locations
  - Purpose of the facility and installation date
  - Client Contact (facilities engineer, project manager, project engineer, design engineer, plant manager) and the current phone number
  - The geomembrane mil thickness and the total square footage installed
  - Copy of the HDPE geomembrane lining manufacturer license to the installation contractor/subcontractor showing license date and expiration date

#### B. Certifications:

Submit certification letter(s) from the manufacturer by an Officer of the Corporation or independent ASTM certified testing laboratory report(s) stating that the raw materials and the production products meet or

exceed the National Sanitation Foundation, Standard 54 for secondary containment of hydrocarbons. Certifications shall include applicable roll alpha-numeric identification that is traceable to the material(s) and the test result report(s).

#### 1.6 Quality Control Reports

Quality Control Reports for Quality Control Certificate and Field Welding Quality Control Reporting shall be submitted. Report Forms are provided as the minimum report information format. Other standard reports can be used if all the minimum information is provided in said standard report. Subcontractor shall submit copies of his standard reports with his proposal for evaluation and/or acceptance.

#### A. Recording of Results

Daily documentation of all non-destructive and destructive testing shall be provided to the Inspector by the Installer. This documentation shall identify all seams that initially failed the test and include evidence that these seams were repaired an successfully retested.

#### B. Report Forms

Copies of the forms are provided in the 6.0 Appendix.

1.	Form 1	Certificate of Acceptance of Soil Subgrade
2.	Form 2	Panel Placement Log
3.	Form 3	Geomembrane Field Trial Seam Log
4.	Form 4	Geomembrane Seaming Record
5.	Form 5	Geomembrane Seam Air Pressure Test Log
6.	Form 6	Repair Log
7.	Form 7	Geomembrane Seam Destructive Sample Loc

#### 1.7 <u>Manufacturer and Installer Recommendations</u>

The minimum requirements are indicated on the contract drawings and these specifications. If these minimum requirements are inadequate or deficient for the intended use of the geomembrane lining system, the Manufacturer and the Installation Subcontractor shall notify the Contractor in writing before purchase

and/or installation begin. Said inadequacies or deficiencies shall be reviewed with the Owner and Contractor and a resolution agreed upon before commencement of the work.

#### 1.8 Containment Characterization

The military operations have resulted in soils being contaminated with munitions residues. These soils are designated as hazardous waste.

#### A. Explosives Contaminants

1.	TNT	2,4,6-Trinitroluene
2.	RDX	1,3,5-Hexahydro - 1,3,5-Trinitrohydrazine
3.	HMX	1,3,5,7-Hexahydro - 1,3,5,7-Tetranitrotriazine
4.	Tetryl	N,2,4,6-Tetranitro - N-Methylaniline

#### B. Degradation By-Products

1.	4ADNT	4-Amino - 2,6-Dinitrotoluene
2.	2ADNT	2-Amino - 4,6-Dinitrotoluene
3.	2,4DNT	2,4-Dinitrotoluene
4.	2,6DNT	2,6-Dinitrotoluene
5.	1,3,5TNB	1,3,5-Trinitrobenzene
6.	DNB	1,3-Dinitrobenzene

#### PART 2 PRODUCTS

#### 2.1 Established Standards

The products are specified herein by manufacturer and trade name to establish standards of quality and performance. Products of other manufacturers may be substituted for the specified products, provided such substitutions meet the specified requirements, and are reviewed and accepted in writing by the Engineer. The following materials shall conform to the respective specifications and other requirements stipulated below:

#### A. HDPE Geomembrane

The geomembrane shall be HDPE compound resin with carbon black for ultra-violet resistance as manufactured by Poly-Flex Inc., Gundle Lining Systems, Inc., National Seal, Inc. and/or equivalent product(s). The geomembrane surfaces shall be free of striations, roughness, pinholes, holes, bubbles, blisters, undispersed raw materials, or any contamination

by debris or foreign matter. Labels shall identify the mil thickness, dimensions, batch, roll numbers, and manufacturer. The nominal minimum mil thickness is indicated on the contract drawings.

#### B. HDPE Sheeting

The sheeting shall be HDPE resin with carbon black for Ultra-violet resistance. Sheeting thickness shall be indicated on the drawings.

#### C. Drainage Net

Drainage net shall be an HDPE compound net-like product of overlapping polyethylene strands that permit transmission of fluids to the non-woven geotextile composite material. The net shall be Gundle Gundnet XL-14 or an equivalent product.

#### D. Neoprene Gaskets

Gasket materials shall be neoprene, closed cell, 1/4" thick, with single sided pre-applied adhesive as manufactured by Poly-Flex Inc. or and equal product.

#### E. Banding Clamps

Metal banding clamps and hardware shall be 304 stainless steel minimum.

#### F. Flashing Cement

Mastic cement shall be Poly-Flex Neoprene Cement by Poly-Flex Inc. or an equal product.

#### G. RTV Sealant

Sealant shall be General Electric Silicone RTV 103, or an equal product.

#### H. Anchorage

Anchorage shall be Gundlock or an equivalent product of HDPE extruded shape, designed to provide a mechanical anchor attachment of the HDPE membrane lining system.

#### 2.2 Properties

#### A. HDPE Geomembrane Properties

The high density polyethylene geomembranes shall meet or exceed the National Sanitation Foundation (NSF) Standard 54 specifications properties. The minimum specified properties are as follows:

Subcontractor shall submit properties of proposed Geomembrane materials with his proposal. Values listed in the table should meet most HDPE supplier specifications.

PROPERTY	TEST METHOD	MINIMUM 80 mil (2.0mm)	VALUES 100 mil (2.5mm)	
Thickness, mils, minimum	ASTM D 1593	72	90	
Density (g/cc), minimum	ASTM D 1505	.94	.94	
Melt Index (g/10 minutes), maximum	ASTM D 1238	0.40	0.40	
Carbon Black content (%)	ASTM D 1603	2-3	2-3	
Carbon Black Dispersion	ASTM D 3015	A1/A2	A1/A2	
Tensile Properties	ASTM D 638			
<ol> <li>Tensile Strength @ Yield (pounds/inch specimen)</li> <li>Tensile Strength @</li> </ol>	Type IV Dumb-bell, 2" gauge length, 2-in/min.	184	230	
Break (pounds/inch width)		320	400	
3. Elongation at Yield (%)		13	13	
4. Elongation at Break (%)		600	600	
5. Modulus of Elasticity		80,000	80,000	
Tear Strength (pounds)	ASTM D 1004 Die C	65	70	
Puncture Resistance (lbs)	FMTS 101 B, Method 2065	105	130	
Hydrostatic Resistance (pounds/square inch)	ASTM D 751	500	600	
Low Temp. Brittleness	ASTM D 746	<-94°F	<-94°F	
Dimensional Stability (% change maximum)	ASTM D 1204 (212°F, 15 min.)	<u>+</u> 2	<u>+</u> 2	
volatile Loss (%) Resistance to Soil Burial (% change maxi. in orig. value)	ASTM D 1203 ASTM D 3083 Type IV specimen	0.4	0.4	

A. Tensile Strength @ 2-in./minute and break		10	10
B. Elongation @ Yield & Ozone Resistance	ASTM D 1149	no cracks	no cracks
(7 days, 100 pphm, 104°F, bent loop)			
Environmental Stress Crack (hours)	ASTM D 1693	1500	1500
Water Absorption	ASTM D 570	<0.1	<0.1
(% change max. in original weight)			
Coefficient of Linear Thermal Exp. (cm/cm°C) x 10	ASTM D 696	1.2	1.2
Moisture Vapor Transmission Rate	ASTM E 96	0.0005	0.0005
(gal/100 sqin per day)			

#### B. HDPE Drainage Net

PROPERTY	TEST METHOD	MINIMUM VALUES	
Thickness, mils, minimum)	ASTM D 1593	200	
Density, g/cc	<b>ASTM D 1505</b>	0.94	
Melt Flow Index, g/10 min.	<b>ASTM D 1238</b>	0.3 max.	
Tensile Strength @ Break	<b>ASTM D 751</b>		
Machine Direction	ppi	25 min.	
Cross Direction	ppi	15 min.	

#### 2.3 Life Cycle

The life cycle for the geomembrane lining system shall be thirty (30) years.

#### 2.4 Qualifications

The manufacturer of the HDPE geomembrane materials and the installation contractor/subcontractor of these materials shall satisfy specific qualifications before commencement of the work.

#### A. Manufacturer

The HDPE geomembrane materials manufacturer shall be listed by the National Sanitation Foundation as an acceptable producer of HDPE geomembrane Flexible Membrane Liners per NSF Standard 54. The manufacturer shall have at least five (5) years continuous manufacturing experience producing more than 20,000,000 square feet of HDPE geomembrane materials. The Owner and/or his representative shall be permitted to visit the manufacturing facilities.

#### B. Installation Subcontractor

The installation Subcontractor shall be the HDPE geomembrane manufacturer or an approved, trained and licensed installer of the geomembrane manufacturer with more than two (2) years continuous installation experience. The installation shall be under the constant direction of a single Field Installation Supervisor. The Field Installation Supervisor shall remain on site and be responsible for the installation, layout, seaming, patching, testing, repairs, review and acceptance, and all other required and necessary activities. This Field Installation Supervisor shall have supervised the installation of more than 2,000,000 square feet of HDPE geomembrane lining systems. Seam work shall be under the direction of a Master Seamer who can also be the Field Installation Supervisor.

#### PART 3 <u>EXECUTION</u>

#### 3.1 Sitework and Foundation Work

Subcontractor shall define minimum retention pond storage and installation requirements for the geomembrane liner system. As a minimum, the following guidelines shall be adhered to during field installation. The Geotechnical Engineer or his representative shall supervise all subgrade and the Engineer the above grade foundation work and/or foundation preparation work. All surfaces to be lined shall be smooth, free of all foreign and organic material(s), sharp objects, or debris of any kind. The subgrade shall provide a firm, unyielding surface without sharp changes or abrupt breaks in the grade. Stone and rocks larger than 3/8" in diameter shall not be present in the upper 6" of soil directly beneath the geomembrane lining system. The installer shall provide daily written certification(s) that the foundation surface(s) for the geomembrane lining system are acceptable.

#### 3.2 Delivery

Off loading and storage of the materials shall be the responsibility of the Installer. Contractor shall have a designated material storage area for the Installer. The Installer shall be responsible for replacing any damaged or unacceptable materials at no additional cost to the Owner or Contractor. No off-loading shall be done without the presence of the Installer and/or his designated representative or his inspector.

#### 3.3 Storage

The materials shall be stored in accordance with the manufacturer's recommendations and instructions. The HDPE geomembrane shall be protected from puncture, dirt, grease, water, moisture, mud, abrasion, excessive heat and other damage. The HDPE geomembrane rolls shall be stored on a prepared surface and shall not be stacked more than two (2) rolls high. Wooden pallets are not acceptable.

#### 3.4 Placement

Adequate loading, sand bags or similar items that will not damage the geomembrane lining system shall be positioned such that wind uplift is prevented at the perimeter and at panel sections. Care shall be taken to prevent crimps or scratches to the geomembrane lining during placement. Protect the geomembrane lining from heat damage, workmen tools and shoes, or any activities that can damage the geomembrane. Direct contact with the HDPE geomembrane shall be protected with geotextiles, extra geomembrane lining or other suitable protective materials.

#### 3.5 Weather Conditions

Geomembrane lining system shall be installed between 40°F and 100°F temperature. Geomembrane placement and seaming shall not be performed during any precipitation, that is rain, fog, dew, frost, snow, ice formation or conditions causing condensation formation. Installation operations shall be halted during excessive wind conditions, as determined by the Installer and/or the Inspector.

#### 3.6 Sharp Bends

Planer direction changes shall be rounded or cant filler stripping provided to avoid sharp bends that can cause damage to the geomembrane lining system. Every effort shall be made to prevent brittle fracture and stress failure of the geomembrane liner system and components.

#### 3.7 Seaming Orientation

Seams shall be orientated parallel to the line of maximum slope, directed down slope and not across the slope when the slope is greater than 1" on 12". Field seams shall be minimized in corners and odd polygon shape locations. Seams shall be aligned with the minimum number of wrinkles.

#### 3.8 Seam Overlap

Panels of geomembrane lining shall have a six (6) inch overlap such that performance testing can be conducted.

#### 3.9 Solvents or Adhesives

Solvents and adhesives can not be used unless written approval has been obtained from the geomembrane lining manufacture and written review and acceptance has been obtained from the Engineer.

#### 3.10 Manufacturer's Installation Procedures

The geomembrane lining system manufacturer's installation procedures manuals shall be provided to the Contractor and his inspection representative. These installation procedures manuals shall be submitted three (3) weeks before the installation work can begin.

#### 3.11 Field Seams

All field seams shall comply with ASTM D 413, D 638, D 3083, and/or D 4437. Approved field seaming processes are hot shoe fusion welding and extrusion welding. Welding rods or beads used for extrusion welding shall be HDPE with the same physical properties as the resin used in the manufacture of the HDPE geomembrane lining materials.

#### 3.12 Anchorage

The anchorage system shall have rounded corners so as to avoid sharp edges and bends in the geomembrane lining system. Anchorage shall be Gundlock or an equivalent product of HDPE extruded shape designed to provide a mechanical anchor attachment for the HDPE membrane lining system. Anchorage system can be cast in place or embedded in precast concrete components. Follow manufacturer's fabrication and installation instructions. If a tail anchorage system is used, provide two (2) feet of tail in accordance with the manufacturers requirements.

#### PART 4 QUALITY CONTROL

#### 4.1 General

Quality control shall involve testing, verification, review and acceptance, repair and records. Base pricing for this work shall include, as a minimum, the following quality verification and testing methods, evaluation and acceptance criteria, repair requirements, and records of the results as specified herein.

#### 4.2 Factory Seam Quality Verification

The Contractor or his Inspector shall require the Installation Subcontractor to have twenty (20%) percent of factory fusion welds tested using non-destructive air pressure tests and/or vacuum tests. Additional testing may be required at the Installation Subcontractor's expense. Failed test seams shall be retested after repair.

#### 4.3 Field Seam Quality Verification

Geomembrane lining system field seams shall be tested using non-destructive and destructive testing. Field test seams shall be taken at each seaming apparatus used each day, at the end of each four (4) hour period and at the Engineer's and/or Contractor's discretion or his Inspector's discretion.

All test seams shall be made at a location selected by the Inspector in the area of the seaming and in contact with the subgrade. The test seam samples shall be 10 feet long for hot shoe welding and 3 feet long for extrusion welding with the seam centered lengthwise. Specimens 1 inch wide shall be cut perpendicular to seam from each opposite end of the test seam by the Inspector. The Inspector shall use a tensionmeter to test these specimens for shear and peel strength. If a test seam

fails to meet field seam specifications, the seaming apparatus and/or seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and two consecutive successful full test seams are achieved.

#### 4.4 Non-Destructive Seam Testing

The Installer shall non-destructively test all field seams over their full length. Testing will be carried out as the seaming progresses, not at the completion of the job. All test equipment, including, but not limited to, the following, shall be furnished by the Installer:

#### A. Vacuum Box Testing

The minimum equipment for testing single wedge fusion seams and extrusion seams shall be comprised of the following:

- 1. A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge.
- 2. A steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections.
- 3. A rubber pressure/vacuum hose with fittings and connections.
- 4. A plastic bucket and wide brush, mop or spray assembly.
- 5. A soapy solution.

#### B. Non-Destructive Testing Procedures

The following non-destructive procedures shall be followed by the Installer:

- Excess sheet overlap shall be trimmed away
- 2. Clean the window, gasket surfaces and check for leaks
- 3. Energize the vacuum pump and reduce the tank pressure to approximately 5 psi
- 4. Wet a strip of geomembrane approximately 12 inches by 48 inches (length of box) with the soapy solution
- 5. Place the box over the wetted area and compress
- 6. Close the bleed valve and open the vacuum valve
- 7. Ensure that a leak tight seal is created
- 8. For a period of approximately 5-10 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles

- 9. If no bubbles appear after 15-30 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inches overlap and repeat the process
- 10. All areas where soap bubbles appear shall be marked and repaired and then retested.

#### C. Destructive Testing Procedures

The following destructive procedures shall apply to locations where seams cannot be non-destructively tested, as determined by the Inspector:

- 1. If the seam is accessible to testing equipment prior to final installation, the seam shall be non-destructively tested prior to final installation.
- If the seam cannot be tested prior to final installation, the seaming operations shall be observed by the Inspector for uniformity and completeness.
- D. Air Pressure Testing (For Double Fusion Seam Only)

The following procedures are applicable to those processes which produce a double seam with an enclosed space:

- 1. Equipment for testing double fusion seams shall be comprised of the following:
- E. An air pump equipped with pressure gauge capable of generating and sustaining a pressure between 25 and 30 psi and mounted on a cushion to protect the geomembrane.
- F. A manometer equipped with a sharp hollow needle, or other approved pressure feed device.
  - 1. The following procedures shall be followed by the Installer:
    - a. Seal one end of the seam to be tested.
    - b. Insert needle or other approved pressure feed device through the sealed end of the channel created by the double wedge fusion weld.
- G. Energize the air pump to verify the unobstructed passage of air through the channel.
- H. Seal the other end of the channel.
- I. Energize the air pump to a pressure between 25 and 30 psi, close valve, and sustain pressure for approximately 5 minutes.
- J. If loss of pressure exceeds 4 psi, or pressure does not stabilize, locate faulty area, repair and retest.

K. Remove needle or other approved pressure feed device, deflate the entire length of the seam and seal.

#### L. Destructive Seam Testing

The Installer shall provide the Inspector with a minimum of one destructive test sample per 500 feet of seam length from a location specified by the Inspector. The Installer shall not be informed in advance of the sample location.

#### 1. Sampling Procedure

In order to obtain test results prior to completion of liner installation, samples shall be cut by the Installer as the seaming progresses. Sampling times and locations shall be determined by the Inspector. The Inspector shall witness the collection of all field test samples and the Installer shall mark all samples with their location, roll and seam number. The Installer shall also record in written form, the date, time, location, roll, seam number, ambient temperatures, and pass or fail description. A copy of the information must be attached to each sample portion. All holes in the geomembrane resulting from obtaining the seam samples shall be immediately repaired. All patches shall be vacuum tested.

#### 2. Size and Disposition of Samples

The samples shall be 12 inches wide by 24 inches long with the seam centered lengthwise. The sample shall be cut into two equal length pieces, half to be given to the Inspector and the other half to be given to the Owner's Representative. If the Installer desires a sample the size should be increased to 12 inches wide by 36 inches long.

#### 3. Field Laboratory Testing

Five test specimens shall be tested per retention pond. The Inspector shall cut ten, one inch wide, test specimens from his sample and these shall be tested by the Inspector. The Inspector shall have five specimens tested for seam strength and five for peel strength. To be acceptable, four out of the five test specimens must pass. Any specimen that fails through the weld or by adhesion at the weldsheet interface and shall be considered a failure.

#### 4. Independent Laboratory Testing

The Inspector will package and shop five (5) seam samples per retention pond, basin and/or foundation from the Installer to a Laboratory for the determination of shear and peel strengths. The test method and procedures to be used by the Independent Laboratory shall be the same used in field testing, where seam samples are 1 inch wide, and the grip separation rate is 2 ipm. Four of five test specimens per sample shall pass.

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#### 5. Procedures for Destructive Testing

The Inspector will document all actions taken in conjunction with destructive testing. The following minimum procedures shall apply whenever a sample fails the destructive testing procedures:

- a. The Installer shall cap strip the seam between the failed location and any passed test location.
- b. The Installer shall retrace the welding path to an intermediate location a minimum of 10 feet from the location of the failed test, at the Inspector's discretion, and take a small sample for an additional field test. If this test passes, the seam shall be cap stripped between that location and the original failed location. If the test fails, then the process is repeated.
- c. Over the length of seam failure, the Installer shall either cut out the old seam, reposition the panel and reseam, or add a cap strip, and as required by the Inspector.
- d. After reseaming or placement of the cap strip, additional destructive field test(s) shall be taken within the reseamed area. The reseamed sample shall be acceptable if four (4) out of the five (5) test specimens pass. If test results are not acceptable, this process shall be repeated until the reseamed length passes and judged satisfactory by the Inspector.

#### 4.5 <u>Alternate Quality Control</u>

Alternate quality control methods and testing can be submitted for review and/or acceptance by the Engineer. The geomembrane lining manufacturer and his certified or accepted Installer shall submit his quality control methods, procedures and requirements for both factory and field operations. As a minimum, these documents shall cover the following:

- A. Factory Seam Quality Verification
- B. Field Seam Quality Verification
- C. Liner quality Verification
- D. Non-destructive Seam Testing
- E. Destructive Seam Testing
- F. Defects and Repairs
- G. Record Keeping

#### 4.6 Defects and Repairs

All seams and non-seam areas of the geomembrane shall be inspected by the Installer and the Inspector for defects, holes, blisters, undispersed raw materials,

and any sign of contamination by foreign matter. Light reflection from the geomembrane helps to detect defects. The surface of the geomembrane shall be clean at the time of inspection. The geomembrane surface(s) shall be brushed, blown, or washed by the Installer if the amount of dust or mud inhibits inspection. The Inspector shall decide if additional cleaning of the geomembrane is needed to facilitate inspection.

#### A. Evaluation

Each suspect defect location in seam and non-seam areas shall be non-destructively tested as appropriate in the presence of the Inspector. Each location that fails the non-destructive testing shall be marked by the Inspector, and repaired accordingly.

#### B. Repair Procedures

- 1. Defective seams shall be restarted/reseamed as described in these specifications.
- 2. Small holes shall be repaired by extrusion cap welding. If the hole is larger than 1/4 inch, it shall be patched.
- 3. Tears shall be repaired by patching. Where the tear is on a slope or an area of stress and has a sharp end it must be rounded prior to patching.
- 4. Blisters, large cuts and holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches and/or replacement.
- 5. Surfaces of HDPE which are to be patched shall be abraded and cleaned no more than 15 minutes prior to the repair. No more than 10% of the thickness shall be removed.

#### C. Patches

Patches shall be round or oval in shape, made of the same geomembrane material, and extend a minimum of six (6) inches beyond the edge of defects. All patches shall be of the same compound and thickness as the geomembrane specified. All patches shall have their top edge beveled with an angle grinder prior to placement on the geomembrane. Patches shall be applied using approved methods only in accordance with the manufacturer's installation procedures manual.

#### D. Restart/Reseaming Procedures

The welding process shall restart by grinding the existing seam and rewelding a new seam. Welding shall begin where the grinding started and must overlap the previous seam by at least two (2) inches. Reseaming over an existing seam without regrinding shall not be permitted.

# E. Verification of Repairs

Each repair shall be non-destructively tested, except when the Inspector requires a destructive seam sample obtained from a repaired seam. Repairs that pass the non-destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.

# 4.7 Acceptance

The Installer (Installation Subcontractor) shall retain responsibility for the geomembrane lining system until acceptance has been received by the Owner or his representative. Acceptance shall have the following conditions met:

- A. The installation has been completed, tested and inspected.
- B. Documentation and verification has been completed of all field seams and repairs with the required testing conducted.
- C. The documentation records have been transferred to the Owner or his representatives and the Contractor has provided written notification.

# 4.8 Warranty

The geomembrane lining system manufacturer and the Installation Contractor/Subcontractor shall each warrant their respective materials and work for the life cycle of the retention pond(s) system. Both warranties shall cover the materials and workmanship for the life cycle. The warranties shall apply to normal use and service by the Owner and shall exclude mechanical abuse, puncture by equipment or people, exposure to harmful chemical(s), heat, explosions, flooding or tornadoes. These warranties shall have provisions for the repair or replacement of the defect(s) or defective area(s) upon written notification and demonstration by the Owner of specific non-conformance of the geomembrane lining system and/or installation. Repair and/or replacement shall be completed at no additional cost to the Owner.

#### PART 5 MEASUREMENT AND PAYMENT

NOT USED

**END OF SECTION 02275** 

# SECTION 02513 ASPHALT CONCRETE PAVING

#### PART 1 GENERAL

#### 1.1 Description

This specification along with the drawings covers the furnishing of all materials, products, accessories, tools, equipment, services, transportation, labor, and supervision required for installation of a complete waterproof in-place asphaltic concrete paving system.

#### Work Included:

- A. Final preparation of subgrade
- B. Furnish and place subbase course
- C. Furnish and place base course
- D. Furnish and place asphaltic concrete paving
- E. Asphaltic concrete walks and curbs

#### 1.2 Related Sections

Section 02100

Site Clearing

Section 02200

Structure Excavation and Backfilling

# 1.3 Quality Assurance

#### A. Contractor Qualifications

For actual placing and finishing of the asphaltic concrete surfaces and operation of the required equipment, use only personnel who are thoroughly trained and experienced in the skills required.

# B. Standards

Specific sections of the Indiana State Highway Department Standard Specification for Road Construction that most nearly meet the requirements of this specification as to gradation of aggregates, asphalt content, and method of construction may be used in lieu of this specification. These are the mixes that local asphalt mixing plants are experienced and prepared to furnish and are setup to meet state and local requirements.

# 1.4 Reference Standards

The following publications listed below form a part of this specification to the extent indicated by the reference thereto. Publications listed refer to the latest edition as of the issue date of this specification. The references are referred to in the text thereafter by basic designation only.

# A. American Society for Testing and Materials (ASTM):

1.	D 242	Standard Specification for Mineral Filler for Bituminous Paving Mixture
2.	D 692	Standard Specification for Course Aggregate for Bituminous Paving Mixtures
3.	D 946	Standard Specification for Penetration - Graded Asphalt Cement for Use in Pavement Construction
4.	D 1073	Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
5.	D 1557	Test Methods for Laboratory Compaction Characteristic of Soil Using Modified Effort (56,000 ft. lbf/ft³ (2,200 kN-m/m³) )
6.	D 2027	Standard Specification for Cut Back Asphalt (Medium-curing Type)
7.	D 2028	Standard Specification for Cut Back Asphalt (Rapid-curing Type)

#### PART 2 PRODUCTS

#### 2.1 Materials

#### A. Subbase Material

The material shall consist of two inch granular, free-draining material such as limestone, crushed limestone, clinker, gravel, shale, or quarry spalls. The material shall be free from vegetable matter and other unsuitable material. The subbase material shall meet ASTM C 33 specifications and approved by the Indiana Department of Transportation.

#### B. Base Course Material

The material shall be #53 crushed limestone, crushed or uncrushed gravel, blastFurnace slag, or reef shells conforming to the following gradation:

Sieve Size	Percentage by Weight
1 -1/2"	100
1"	90-100
3/4"	50-85
1/2"	35-65
No. 4	30-45
No. 8	25-35
No. 30	10-25
No. 200	2-9

# C. Asphalt Cement

Asphalt cement shall be a petroleum asphalt, 85-10 penetration grade, conforming to ASTM D 946. For curb work, 60-70 penetration grade, asphalt cement shall be used.

# D. Aggregate

- 1. Coarse aggregate shall consist of crushed stone and/or crushed gravel conforming to ASTM D 692.
- 2. Fine aggregate shall consist of natural sand, sand prepared from stone, or a mixture of both conforming to ASTM D 1073.
- 3. Mineral Filler shall consist of limestone dust or Portland cement conforming to ASTM D 242.

# E. Tack Coat

Tack coat material shall be RC-70 conforming to ASTM D 2028.

#### F. Prime Coat

Prime coat material shall be MC-70 conforming to ASTM D 2027.

# G. General Composition of Mixture for Paving and Walks

1. The materials forming the asphaltic concrete mixture shall be combined in accordance with the following limits of aggregate gradation and asphalt content:

	Wearing Course % Passing By Weight	Binder Course % Passing By Weight
1"	100	-
3/4"	90-100	-
1/2"	65-80	100
3/8"	30-55	85-100
No. 4	30-40	50-60
No. 10	25-35	36-44
No. 20	16-24	25-32
No. 40	7-12	15-23
No. 80	3-6	5-12
No. 200	1-4	2-6
Asphalt Cement,	-	-
Weight percent of Total Mix	4.2-5.0	5.5-6.0

2. A job-mix formula shall be established in accordance with the accepted procedures of the Indiana Highway Department. The job-mix formula shall be submitted to the Contractor for review and acceptance. After the job-mix is established, all mixtures for the project shall conform thereto within the following ranges of tolerances:

Passing No. 4 & larger sieves	± 7.0 percent
Passing No. 10 sieve	± 5.0 percent
Passing No. 40 sieve	± 4.0 percent
Passing No. 80 sieve	± 4.0 percent
Passing No. 200 sieve	± 2.0 percent
Asphalt Content	± 0.4 percent
Temperature of Mixture	± 25°F

The mixture, however, shall have a temperature between 290°F and 320° when it leaves the asphalt plant.

- H. General Composition of Mixture for Curbs
  - 1. Aggregate gradation and asphalt content limits shall be as follows:

Sieve Size	& Passing By Weight	
3/4" ½" No. 4 No. 8		100 85-100 65-80 0-65
No. 50 No. 200 Asphalt Cement, Weight Percent of	18-30	5-15 6.0-9.0
Total Mix		0.0 0.0

Other gradings may be used if they have a history of satisfactory performance and have been approved by the Contractor.

2. The job-mix formula shall be determined in the laboratory or by field trial. Adjustments shall be made as necessary to provide sufficient workability during placing and to ensure a finished curb of adequate stability, desired surface texture, and relatively low (3-8 percent) air void content.

# PART 3 EXECUTION

# 3.1 <u>Subgrade Preparation</u>

The rough graded subgrade shall be shaped and prepared to the line, grade, and cross section shown on the drawings and per technical specification Section 02200.

# 3.2 Placing Subbase Material

# A. Spreading

The subbase material shall be deposited and spread upon the completed and approved subgrade in uniform, nearly horizontal layers, without segregation of size, to such loose depth that, when compacted, the total course will have the required thickness.

# B. Compaction

After each lift of subbase course material is spread and shaped, the material shall be compacted to a minimum of 95% of maximum dry density as determined in accordance with ASTM D 1557. An approved vibrating roller shall be used. Compaction may be supplemented by a 10-ton, three-wheel tandem roller. The contractor shall use such construction procedures, including sufficient wetting and number of passes of the vibrating roller, to ensure that the above density is attained.

# 3.3 Placing Base Course Material

# A. Spreading

If required thickness of the well graded granular base course material exceeds 7 inches, the material shall be placed in two or more layers. If spreading devices such as spreader boxes are used which will ensure proper depth and alignment, forms will not be required. Segregation shall be avoided regardless of the method used.

# B. Compaction

After each lift of base course material is spread and shaped, the material shall be compacted to a minimum of 95% of maximum dry density as determined in accordance with ASTM D 1557. An approved vibrating roller shall be used. Compaction may be supplemented by a 10-ton, three-wheel tandem, or pneumatic-tired roller. The contractor shall use such construction procedures, including sufficient wetting and number of passes of the vibrating roller, to ensure that the above density is attained.

# 3.4 Placement of Asphaltic Concrete Paving

# A. Receipt of Material

- 1. Asphaltic concrete shall be covered with tarpaulins until loaded. Temperature should be at least 280°F when placed.
- 2. Asphaltic concrete shall not be placed when ambient temperature is below 50°F, nor during fog, rain, snow or other unsuitable conditions.
- 3. No mixture shall be dispatched from the plant so late in the day that it cannot be spread and compacted during the daylight hours of that same day.

#### B. Spreading

- The base course surface on which the asphaltic concrete mixture is to be spread, shall be free from objectionable or foreign material at the time of spreading. Spreading shall be done using a self-propelled asphalt paving machine capable of maintaining line, grade, crown and minimum surface thickness shown on the drawings. The equipment shall also be provided with means for heating the screed members so as to prevent the accumulation of bituminous material.
- 2. At locations where it is impractical to use conventional mechanical methods, acceptable hand methods may be used for placing and spreading. Lutes shall be used for spreading. The use of rakes will not be permitted.

3. Contact surfaces of curbing, gutters, manholes, etc., shall be painted with a uniform tack coat of hot asphalt cement before material is placed against them.

# C. Compaction

- After spreading, the compaction, unless otherwise directed, shall be performed with a three-wheel or tandem self-propelled roller having a minimum weight of ten tons. Steel wheel rollers shall be equipped with adjustable scrapers to keep rollers clean and with sufficient means of keeping wheels wet to prevent asphalt from sticking to the rollers.
- 2. The rolling should be completed within 30 minutes of the time the material was spread. Compaction, however, must be completed before the temperature of the asphaltic concrete mixture has dropped below 180°F.
- 3. Hand held vibrators or small (PUB) roller shall be used in areas not accessible to self-propelled rollers.
- 4. Roll surfaces in two directions if possible and until no roller marks are visible.
- 5. The asphaltic concrete material shall be compacted to obtain a density of not less than 95% of the density obtained by laboratory compaction for the surface course, and a density of not less than 90% of the density obtained by laboratory compaction for the binder course. Laboratory compaction is the average density of the material being placed, obtained by the Standard Marshall Method (50 blows top and bottom face).
- The surface of the mixture after compaction shall be smooth and true to the established crown and grade within the tolerances specified.
- 7. Finished surfaces shall be free of birdbaths, and shall have no variation greater than 1/8 inch when checked with a 10 foot straight edge, unless otherwise indicated on the drawings.

# D. Asphalt Applications.

- 1. Prime Coat. An asphalt prime coat shall be used on untreated granular base materials. Spray apply under pressure a low-viscosity asphalt on the prepared base surfaces at the rate of 0.2 to 0.5 gal/yd². The asphalt should be fully absorbed by the base material and allowed to set and cure before placing the asphaltic paving surfacing.
- Tack Coat. An asphalt tack coat shall be applied over an existing asphalt surfaces and on surface courses as a binder course to insure bond between the superimposed material and the existing

surface. The tack coat must be very thin and uniformly cover the areas to be paved. Spray apply the tack coat asphalt on the prepared asphaltic concrete surfaces at the rate of 0.05 to 0.15 gal/yd<sup>2</sup>.

3. Asphalt Seal Coat. A thin asphalt seal coat surface treatment shall be applied as a waterproofing coat.

# 3.5 Joints

Joints shall be formed by cutting to obtain a vertical face for the full depth of the course. Paint or spray the face of the joint with RC-70 immediately prior to paving. Joints must present the same texture, density, and smoothness as the other sections of the course.

# 3.6 Asphaltic Concrete Walks

# A. Preparation of Subgrade

The subgrade shall be constructed to the required elevations as shown on the drawings. The subgrade shall be thoroughly compacted and finished to a firm, smooth surface.

# B. Forming

In cut areas, the soil shall be boxed out at edges of the walk and forms will not be necessary. In fill areas, the walks shall be formed with 2" x 6" treated or untreated lumber which shall be left in place.

- C. The asphaltic base material conforming to paragraph 2.1.7, (General Composition of Mixture for Paving) shall be deposited on dry subgrade, spread uniformly, and compacted.
- D. The asphaltic surface course conforming to paragraph 2.1.7, (General Composition of Mixture for Paving) shall be placed and compacted using a weight of roller not to exceed 5 tons.

# E. Backfilling and Finishing

All walks shall be neatly finished and graded to the required cross section.

# 3.7 Asphaltic Curbs

- A. Hot plant-mixed asphaltic concrete curbs shall be machine laid and constructed to the lines, grades and typical cross sections shown on the drawings. Exact cross sections of curbs may vary according to steel screeds locally available.
- B. Asphalt curbs shall be placed on existing pavement surfaces. Unless otherwise specified, a light tack coat shall be applied before placing the curb. Immediately prior to application of the asphalt tack coat, all loose and

foreign material shall be removed. For proper support on pavement edges, the back of curb shall be at least 2 inches in from the pavement edge.

C. No forms shall be required for machine-placed curbs. Machine laid work usually shall require no additional compaction, but in areas where it is evident that compaction is inadequate, the mix shall be adjusted, forward movement of the machine retarded by braking, or other measures taken to provide adequate compaction.

#### D. Joints

Asphalt curb construction shall be a continuous operation in one direction to eliminate curb joints. Where conditions exist that this is not practicable, the joints between successive days' work shall be made carefully in a manner that will ensure a continuous bond between old and new sections of the curb

# E. Curing

Curbs shall be protected from traffic by a barricade or other suitable method until the heat of the asphalt mixture has dissipated and the mixture has attained its proper degree of hardness.

#### 3.8 Finish Tolerances

- A. Finish all surfaces to the following tolerances:
  - 1. Subgrade and Base Course Plus 0.00 feet to minus 0.10 feet from line and grade shown on the drawings.
  - 2. Asphaltic Concrete Plus or minus 0.05 feet at any point from line and grade shown on the drawings.

# 3.9 Protection

- A. No vehicular traffic of any kind shall be permitted on any course for 24 hours.
- B. All foreign materials which may have accumulated on the surface of any course shall be removed before the course is rolled or before subsequent courses are placed thereon.

# **END OF SECTION 02513**

# SECTION 02936 SEEDING BIOREMEDIATION FACILITY CIVIL/UTILITIES WORK

#### PART 1 GENERAL

Provide seed bed preparation, top soiling, fertilizing, seeding, and mulching of all newly graded finished earth surfaces unless indicated otherwise and all areas inside or outside the limits of construction that are disturbed by the subcontractor's operations.

# 1.1 Section Includes

- A. Preparation of subsoil.
- B. Placing topsoil.
- C. Seeding, mulching and fertilizing.
- D. Maintenance.

#### 1.2 Related Sections

- A. Section 01010 Statement of Work
- B. Section 02200 Excavation and Backfilling.
- C. Quality Control Plan.

# 1.3 Definitions

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.
- B. Stand or turf: 95 percent ground cover of the established species.
- C. Topsoil: Fertile, agricultural soil, typical for this locality, capable of sustaining vigorous plant growth, pH and organically adjusted to be compatible with seed mixture specified.

# 1.4 Submittals

A. Maintenance Data: Include maintenance instructions including: cutting method and maximum grass height, types, application frequency, and recommended coverage of fertilizer.

B. Documentation of seed mixture and composition, fertilizer chemical composition, manufacturer's name and indication of conformance to state and federal laws.

# 1.5 Regulatory Requirements

- A. Comply with regulatory agencies for fertilizer and herbicide composition.
- B. Federal Seed Act Rules and Regulations of the Secretary of Agriculture, January 1985 (DOA FSA).

# 1.6 Delivery, Storage, and Protection

- A. Protect seed from drying out and from contamination during delivery, on-site storage, and handling.
- B. Deliver grass seed mixture in sealed packages, bearing the producer's guaranteed analysis for percentages of mixtures, purity, germination, weed seed content, and inert material. The seed shall be labeled in conformance with the Department of Agriculture FSA and applicable state seed laws. Seed in damaged packaging is not acceptable. Wet, moldy, or otherwise damaged seed will be rejected.
- C. Deliver fertilizer to the site in original, unopened containers bearing the manufacturer's chemical analysis, name, trade name, trademark, and indication of conformance to state and federal laws. Instead of containers, fertilizer and lime may be furnished in bulk with a certificate indicating the above information.

All containers shall be properly marked and labeled in accordance with 29 CFR 1910.1200. Material Safety Data Sheets (MSDS) shall accompany the chemical compounds and be reviewed in accordance with the Special Conditions.

- D. Store seed, lime, and fertilizer in a cool dry location away from contaminants.
- E. Do not drop or dump materials from vehicles.

# 1.7 Maintenance Service

A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition for two cuttings.

#### PART 2 PRODUCTS

2.1 Seed Suppliers

Not Used

# 2.2 Seed

# A. Classification

The seed shall be State approved consisting of the latest season's crop. Field mixes will be acceptable when the field mix is performed on site in the presence of the Contracting Officer.

# B. Composition

The seed shall consist of a mixture of the following grasses: Kentucky 31 Fescue, Perennial rye, and Kentucky Bluegrass. The mixture shall consist of 50 lb./ac. Kentucky 31 Fescue, 35 lb./ac. Perennial Rye, and 25 lb./ac. Kentucky Bluegrass for a total of 110 lb. of seed per acre.

# C. Components

The pure seed comprising the seed mixture shall have following properties:

Seed	Minimum percent pure seed	Minimum percent germination and hard seed	Maximum percent weed seed
Kentucky 31 Fescue	98	85	0.75
Perennial Rye	95	90	0.5
Kentucky Bluegrass	85	80	0.5

# 2.3 Top Soil

Top soil shall be obtained from an off-site source free of chemical contaminants. It shall contain from 5 to 20 percent organic matter as determined by the topsoil composition tests of the Organic Carbon, 6A, Chemical Analysis described in DOA SSIR.

Maximum particle size, 3/4 inch, with maximum 3 percent retained on a 1/4 inch screen. Other components shall be within the following ranges:

Silt 25% to 50% Clay 10% to 30% Sand 20% to 35% pH 5 to 7.6

Soluble salts 600 ppm maximum

# 2.4 Accessories

Fertilizer: FS O-F-241, Type I, Class 2, free flowing, uniform in composition with nitrogen-phosphorus potash ratio of 12 percent Nitrogen, 12 percent phosphorus, and 12 percent soluble potash.

Water shall be suitable for irrigation and free of substances or matter that could inhibit vigorous growth of grass.

Mulch: Mulch shall consist of marsh hay for lawn areas. The hay shall be of an air dry condition and of proper consistency for placing with commercial mulch blowing equipment. Mulch shall be free from noxious weeds, mold, and other deleterious materials.

Erosion Control Materials: The following materials are acceptable for erosion control: Net, fiber or excelsior blanket, chemicals, or vegetable based gels. The net may include heavy twisted jute mesh, plastic net, biodegradable paper fabric with knitted yarns, or standard weave burlap. Chemicals may include petroleum oils and resins in solution or high polymer synthetic resin dispersion. The vegetable based gels may include physiologically harmless, without phytotoxic or crop damaging properties, naturally occurring powder hydrophilic additives formulated to provide gels that will form membrane networks of water insoluble polymers within four hours after application.

#### PART 3 EXECUTION

# 3.1 Subgrade Preparation

Verify that the areas required to be turfed have been brought to the required subgrade. Thoroughly till to minimum depth of 6 inches by scarifying, dicing, harrowing, or other approved methods. Remove debris and stones larger than one inch in any dimension remaining on the surface after tillage.

# 3.2 Placing Topsoil

Immediately before placing topsoil, scarify subgrade to a 2-inch depth for bonding of topsoil with subsoil. If the topsoil is placed immediately after subgrade preparation additional scarifying is not necessary. Spread topsoil evenly to a minimum depth of 4 inches. Do not spread topsoil when frozen, excessively wet, or dry. Correct irregularities in finished surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

# 3.3 Fertilizing and Ph Adjustments

- A. Apply fertilizer and pH adjuster according to manufacturers' instructions based on type of seed used.
- B. Incorporate fertilizer, and pH adjuster into the soil to a minimum depth of two inches.

- C. Do not apply fertilizer at same time or with the same machine as will be used to apply seed.
- D. Mix thoroughly into upper two inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

# 3.4 Seeding

*Note:* some surfaces are extreme angles and may require hydroseeding and covering with a mesh fiber to ensure proper germination of the seed.

- A. Immediately before seeding, restore soil to the proper grade. Do not seed when the ground is muddy, frozen, snow covered, or in an unsatisfactory condition for seeding. Do not apply seed in excessive winds. If special conditions exist that may warrant a variance in the above seeding conditions, submit a written request to the Contracting Officer stating the special conditions and a proposed variance.
- B. Apply seed within 24 hours after seed bed preparation. Apply at a rate of 110 pounds per acre evenly in two intersecting directions. Sow one-half the seed in one direction, and sow the remainder at a right angle to the first sowing. Cover the seed to an average depth of one-half inch by means of spike-tooth harrow, cultipacker, or other approved device.
- C. Do not seed areas more than that which can be mulched on same day.
- D. Planting Season: Sow seeds from February 1 to May 1 for spring planting and from August 5 to November 30 for fall planting. Sow seeds from May 1 to August 5 for summer planting per Contractors directions.
- E. Roll seeded area with a roller not exceeding 90 pounds for each foot of roller width. If seeding is done with a culipack-type seeder or by hydroseeding, rolling may be eliminated.
- F. Immediately following seeding and compacting, apply the mulch evenly at a rate of two tons per acre. Anchor by crimping mulch with a serrated disc, or by spraying asphalt emulsion on the mulched surface at 0.02 gallons per square yard. Take precautionary measures to prevent asphalt materials from marking or defacing structures, pavements, utilities, or plants.
- G. Apply water with a fine spray immediately after each area has been mulched.

# 3.5 Seed Protection

A. Identify seeded areas with stakes and string around the area periphery. Set string height to approximately 36 inches and space stakes at approximately 72 inches apart.

B. Subcontractor shall implement erosion control methods for topsoil and seeded areas such as hay bales and storm water runoff diversion. Subcontractor shall provide maintenance of erosion control measures until growth of grasses is sufficient to prevent future erosion.

#### PART 4 QUALITY CONTROL

# 4.1 Quality Assurance

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- B. Provide fertilizer in containers showing manufactures name, type, grade, nutrient proportions, year of production, net weight, date and location of packaging.
- C. Turf establishment period will be in effect until turf has been mowed three times. Mow turfed area to an average height of one and one-half inches when the average height of the grass becomes approximately two and one-quarter inches.
- D. Final inspection will be made upon written request from the subcontractor at least ten days before the last day of the turf establishment period. Final acceptance will be based upon a satisfactory stand of turf. Areas that do not have a satisfactory stand of turf shall be replanted at the subcontractor's expense.
- E. Contractor shall provide Quality Control field inspections as documented in the Quality Control Plan.

#### PART 5 MEASUREMENT AND PAYMENT

NOT USED

**END OF SECTION 02936** 

# SECTION 03200 CONCRETE REINFORCEMENT

# PART 1 GENERAL

#### 1.1 Description

A. This section describes the requirements for concrete reinforcement in concrete structures and foundations, as shown on the Drawings.

# 1.2 Related Sections

Section 03300

Cast-In-Place Concrete

# 1.3 Reference Standards (Latest Edition)

A. ACI 318:

Building Code Requirements for Reinforced

Concrete

B. ANSI/ASTM A 185:

Specifications for Welded Steel Wire Fabric

for Concrete Reinforcement

C. ASTM A 615:

Specifications for Deformed and Plain Billet-

Steel Bars for Concrete Reinforcement

#### 1.4 Submittals

A. Shop Drawings:

Indicate bar sizes, spacing, locations, and quantities

of reinforcing steel, bending, and cutting schedules

and supporting and spacing devices.

# 1.5 Quality Assurance

A. Perform work in accordance with ACI 318.

#### **PART 2 PRODUCTS**

- A. Reinforcing steel shall be made from deformed new billet stock and shall conform to ASTM A 615, Grade 60.
- B. Reinforcement chairs shall be non-corrosive.
- C. All reinforcement shall be free from oil, mill scale and excessive rust or other coatings that will destroy or reduce bond.
- D. Welded Steel Wire Fabric: ASTM A 185 gages, spacing, and dimensions as shown on the Drawings.

- E. Tie Wire: Minimum 16 gage annealed type.
- F. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions (including load bearing pad on bottom to prevent vapor barrier puncture).
- G. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: (Plastic coated steel) type; size and shape as required.

# **PART 3 EXECUTION**

# 3.1 <u>Installation</u>

- A. Accurately form reinforcement to the dimensions indicated.
- B. Bend all bars cold. Do not straighten in a manner which will injure the material.
- C. Space and position bars as shown on the Drawings.
- D. Provide the following concrete minimum protective covering for main reinforcement, unless noted:
  - 1. 3" for all concrete deposited directly against the ground, and for all concrete in liquid retaining structures.
  - 2. 2" for all formed concrete exposed to weather or in contact with the ground or water.
  - 3. 3/4" for concrete slabs and walls and 1-1/2" for beams and girders not exposed to weather nor in contact with the ground.
  - 4. 2" for columns in all cases (protective covering for spirals or ties shall be not less than 1-1/2" nor less than 1-1/2 times the maximum size of coarse aggregate).
  - 5. Concrete protection shall always be at least equal to the diameter of the bars.
- E. Splice and tie reinforcement in accordance with the requirements of ACI 318, and shown on the Drawings.
- F. No welding of reinforcing steel will be allowed.

# **END OF SECTION 03200**

# **SECTION 03300 CAST-IN-PLACE CONCRETE**

#### PART 1 **GENERAL**

#### **Description** 1.1

This section describes the requirements to furnish all labor, material, tools, equipment, and supervision necessary for the construction of all plain and reinforced concrete work as called for on the project drawings and as specified herein.

#### 1.2 **Related Sections**

Section 03200 Concrete Reinforcement

#### Reference Standards (Latest Edition) 1.3

Refere	ence Standards (Latest Ed	ition)
A.	ACI 211:	Recommended Practice for Selecting Proportions for Normal Weight Concrete
B.	ACI 301:	Structural Concrete for Buildings
C.	ACI 302:	Guide for Concrete Floor and Slab Construction
D.	ACI 304:	Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete
E.	ACI 305R:	Recommended Practice for Hot Weather Concreting
F.	ACI 306R:	Recommended Practice for Cold Weather Concreting
G.	ACI 308:	Standard Practice for Curing Concrete
H.	ACI 347R:	Guide for Formwork for Concrete
1.	ACI 350:	Concrete Sanitary Engineering Structures
J.	ACI 504R:	Guide to Sealing Joints in Concrete Structures
K.	ASTM C 31:	Standard Method of Making and Curing Concrete Test Specimens in the Field
L.	ASTM C 33:	Specification for Concrete Aggregates

**SECTION 03300** 

M.	ASTM C 39:	Test for Compressive Strength of Cylindrical Concrete Specimens
N.	ASTM C 94:	Specification for Ready-Mixed Concrete
Ο.	ASTM C 150:	Specification for Portland Cement
P.	ASTM C 172:	Sampling Fresh Concrete
Q.	ASTM C 260:	Standard Specification for Air-Entraining Admixtures for Concrete
R.	ASTM C 330:	Specification for Lightweight Aggregate for Structural Concrete
S.	ASTM C 494:	Specification for Chemical Admixtures for Concrete
Т.	ASTM C 948:	Test Method for Dry and Wet Bulk Density, Water Absorption and Apparent Porosity of Thin Sections of Glass Fiber Reinforced Concrete
U.	ASTM D 1751:	Specification for Pre-Formed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-Extruding and Resilient Bituminous Types)
V.	ASTM D 1752:	Standard Specification for Pre-Formed Sponge Rubber and Cork Expansion Joint Filler for Concrete Paving and Structural Construction
W.	ASTM D 2103:	Specification for Polyethylene Film and Sheeting
Χ.	CRD C 572:	Corps of Engineers Specification for Poly (Vinyl Chloride) Water Stops

# 1.4 <u>Submittals</u>

# A. Design Mixes

- 1. Submit design mixes and laboratory test reports indicating that the concrete ingredients and proportions will result in concrete mixes meeting requirements specified.
- B. Hot and Cold Weather Concreting
  - 1. Submit proposed methods for compliance with hot and cold weather requirements.

#### C. Certificates

 Submit certificate stating that each admixture used is identical in composition to the sample used for acceptance testing and is compatible with all other materials in the design mix.

#### D. Batch Tickets

- 1. Submit delivery ticket from the concrete supplier with each batch delivered to the site, setting forth the following information:
  - a. Name and supplier
  - b. Name of batching plant and location
  - c. Date
  - d. Serial number of ticket
  - e. Truck number and batch number
  - f. Contract number and location
  - g. Volume of concrete (cubic yards)
  - h. Class of concrete (2500 psi, 3000 psi, or 4000 psi)
  - I. Time loaded and amount of water added
  - j. Type and brand of cement
  - k. Weight of cement
  - Maximum size of aggregate
  - m. Weights of fine and coarse aggregates
  - n. Types and amounts of admixtures

#### E. Working Drawings

1. Show details of form types, form ties, expansion joints, and construction joints.

# 1.5 Quality Assurance

- A. Perform work in accordance with ACI 301.
- B. Maintain one copy of all referenced standard documents on site.
- C. Acquire cement and aggregate from same source for all work.
- D. Conform to ACI 305R when concreting during hot weather.
- E. Conform to ACI 306R when concreting during cold weather.
- F. Conform to ACI 504R when installing joint sealer.
- G. Conform to ACI 302 when constructing floor slab.

# 1.6 Supplementary Requirements

This specification shall be supplemented by the following:

- A. Design drawings, which shall take precedence over this specification.
- B. Applicable technical standards as noted on the design drawings.
- C. Local building code requirements.

# PART 2. PRODUCTS

# 2.1 Concrete Materials

A. Cement

Cement shall be Type I Portland Cement, conform to ASTM C150, unless otherwise specified.

- B. Fine and Coarse Aggregate
  - Coarse aggregate shall be gravel or crushed stone, well graded from fine to coarse within prescribed limits, meeting the requirements of ASTM C33. Maximum nominal coarse aggregate shall be 1", except for mass or foundation concrete, maximum size shall be 1-1/2".
  - 2. Fine aggregate shall be sand, clean, and sharp.
- C. Water

Water used in mixing concrete shall be potable and free of injurious amounts of oils, acids, alkali, sulfates, and other deleterious substances.

D. Aggregate for Lightweight Concrete

Where lightweight concrete is specified on the drawings, the aggregate shall conform to ASTM C 330.

# 2.2 Admixtures

Approval of the Contractor is required prior to use of admixtures.

A. Air Entrainment: ASTM C260

B. Chemical: ASTM C494

C. Fly Ash: ASTM C618, Class C

# 2.3 Accessories

# A. Bonding Agent

- 1. Two component epoxy resin "Sonobond" as manufactured by Soneborn Building Products.
- 2. Two component liquid epoxy or paste "Concresive" as manufactured by Master Builders.

# 2.4 <u>Joint Devices and Filler Materials</u>

A. Joint Filler (For Interior or Exterior use)

Type "A": ASTM D 1751 asphalt impregnated fiberboard or felt, ½ inch thick, tongue and groove profile.

B. Joint Filler (For Interior use only)

Type "C": ASTM D 1752 premolded sponge rubber fully compressible with recovery rate of 95 percent.

#### C. Sealant

- 1. Polysulfide or Epoxy, chemical resistant sealer with minimum range of expansion contraction of 25 percent
- 2. Joint primer, backer rod and bond breaker tape, as specified by sealant manufacturer.

#### 2.5 Concrete Mix

- A. Concrete for equipment foundations, paving and structural slabs shall have a minimum compressive strength of 3,000 psi in 28 days, unless design requirements warrant use of concrete with higher strength whereas the contract drawings will indicate minimum compressive strength requirements. The concrete shall be normal weight and proportioned in accordance with ACI 211.
- B. Concrete for liquid retaining structures shall have a minimum compressive strength of 4,000 psi in 28 days. The concrete shall be proportioned in accordance with ACI 211, subject to the following special requirements:
  - 1. Maximum Water-Cement Ratio: 0.45.
  - 2. Minimum Cement Content: 564 lbs. per cubic yard, unless otherwise specified.
  - 3. Air Content: 6 + 1 percent.
  - 4. Slump: 1" minimum, 3" maximum for footing, 4" maximum for beams, slabs, and walls.

- C. Design mixes shall be based on the required over-design factor in ASTM C94, assuming a coefficient of variation equal to 15.
- D. Use accelerating admixtures in cold weather only when approved by Contractor. Use of admixtures will not relax cold weather placement requirements.
- E. Use of calcium chloride will not be permitted.
- F. Use set retarding admixtures during hot weather only when approved by Contractor.
- G. Add air entraining agent to normal weight concrete mix for work exposed to exterior.
- H. Concrete shall be placed at slumps in accordance with ACI 301, with the exception of concrete placed with super elasticizer.
- I. Concrete for electrical duct banks shall have a minimum 9 pounds of red oxide coloring agent added per cubic yard of concrete.

#### 2.6 Formwork

- A. The design and construction of the formwork shall be in accordance with the recommendation of ACI 347R.
- B. Provide forms for all concrete. Do not use earth cuts for vertical surfaces except when indicated.
- C. External corners of structures and foundations above grade shall be formed with one inch chamfer, unless otherwise noted.
- D. Forms for beam and girder sides, column and similar vertical structural members may be removed after 24 hours, provided the concrete is sufficiently hard.
- E. Supporting forms or shoring shall not be removed until structural members have acquired sufficient strength to safely support their own weight and any construction load, but in no case shall they be removed in less than 7 days.

# PART 3 EXECUTION

#### 3.1 Examination

- A. Verify site conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete, are accurately placed, positioned securely, and will not cause hardship in placing concrete.

# 3.2 Preparation

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout or epoxy grout as shown on the drawing per manufacturer instruction.

# 3.3 Placing Concrete

- A. Conform to the requirements of ACI 304, Chapter 6, except concrete for liquid retaining structures shall be placed according to the requirements of ACI 350, Chapter 4.
- B. Concrete sections more than 3 feet in the least dimension are termed mass concrete and shall conform to the special provision of ACI 301, Chapter 14, in addition to all applicable provisions specified.
- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, and anchor bolts are not disturbed during concrete placement.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Do not interrupt successive placement; do not permit cold joints to occur.

# 3.4 Concrete Finishing

- A. Finish concrete surfaces in accordance with ACI 301.
- B. Steel trowel surfaces which are scheduled to be exposed.

# 3.5 Curing and Protection

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure concrete in accordance with ACI 308.

#### 3.6 Field Quality Control

- A. Field inspection and testing will be performed in accordance with ACI 301.
- B. Provide free access to work and cooperate with appointed firm.

- C. Submit proposed mix design of each class of concrete to an inspection and testing firm for review prior to commencement of work.
- D. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
- E. Three concrete test cylinders will be taken for every 75 cubic yards or less of each class of concrete placed in one day.
- F. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. One slump test will be taken for each set of test cylinders taken.

# 3.7 Patching

- A. Allow Contractor to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Contractor upon discovery.
- C. Patch imperfections as directed in accordance with ACI 301.

# 3.8 Defective Concrete

- A. Defective concrete is that which does not conform to required lines, details, dimensions, tolerances, or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Contractor.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Contractor for each individual area.

#### **END OF SECTION 03300**

# SECTION 13121 SPECIFICATION FOR PRE-ENGINEERED BUILDING

# PART 1 GENERAL

# 1.1 <u>Description</u>

- A. This Section describes the design, manufacture and erection of the preengineered building and its foundation as shown on the Drawings.
- B. The building size and general configuration shall be as shown on the drawings. End walls shall be designed for future expansion.

# 1.2 References (Latest Edition)

A.	AISC	Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
B.	ASTM A36	Structural Steel
C.	ASTM A153	Zinc Coating (Hot Dip) on Iron and Steel Hardware
D.	ASTM A307	Carbon Steel Externally Threaded Standard Fasteners
E.	ASTM A325	High Strength Bolts for Structural Steel Joints
F.	ASTM A386	Zinc-coating (Hot-Dip) on assembled Steel Products
G.	UBC	Uniform Building Code, 1991 edition.
H.	ASTM D2244	Instrumental Evaluation of Color Differences of Opaque Materials.
l.	ASTM A446	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (physical) Quality.
J.	ASTM A490	Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.
K.	ASTM A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
L.	ASTM A501	Hot Formed Welded and Seamless Carbon Steel Structural Tubing.

M.	ASTM A525	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements.
N.	ASTM A529	Structural Steel with 42,000 psi (290 MPa) Minimum Yield Point.
Ο.	ASTM A572	High Strength Low Alloy Columbium-Vanadium Steel of Structural Quality.
P.	AWS A2.0	Standard Welding Symbols
Q.	AWS D1.1	Structural Welding Code
R.	FS HH-I-558	Insulation, Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type)
S.	SSPC	Steel Structures Painting Council

# 1.3 System Description

- A. Rigid frame and gable roof, clear span with no interior columns.
- B. Site location The Southwest quadrant of the Crane NSWC, near Crane, Indiana
- C. Subcontractor shall design, fabricate, and erect the three buildings and their foundations at the site location as specified above.
- D. Each building shall have a mesh fabric installed on the sides and one end to provide shielding from wind and help contain fugitive dust. The mesh shall be attached at ground level. Provisions shall be made for easily opening the mesh on the end. Provisions shall be made for the use of mesh on the front of the building, also, if required in the future.
- E. The design of the buildings shall allow for the addition of standard metal walls on the sides and sliding doors on both ends to completely enclose the buildings at some time in the future.

# 1.4 <u>Design Requirements</u>

#### A. General

Completed buildings shall be fabricated to provide completed structures free of excessive noise from wind-induced vibrations under ordinary weather conditions, and in accordance with requirements of the Metal Building Manufacturers Associated "Recommended Design Practices Manual," current issue, excepting the following qualifications:

1. Structural Steel: Structural steel shall be designed in

accordance with the latest edition of AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings," and with the latest edition of AISI "Specification for Design of Cold-Formed Steel Structural Members."

2. Loadings: Building shall be designed for the dead load, the specific live loads, and the combinations of these loads as specified in UBC, 1991, with Indiana Amendments. Reduction of load due to tributary loaded area will not be permitted. In addition to dead load, the following loads shall be included:

Live Load:

Roof live load 20 pounds per square foot

on horizontal projection.

Wind Load:

Per UBC, 1991, with Indiana Amendment

Snow Load:

Per UBC, 1991, with Indiana Amendment

Auxiliary Loads:

Include uniform load of 10 psf to allow "For Weight of future Mechanical and

Electrical Equipment."

- 3. Framed Openings: Framed openings shall be designed to replace structurally the covering and framing displaced. Include door openings for all doors specified hereinafter.
- 4. Welding of Steel: Welding shall be in accordance with AWS D1.1.
- 5. Deflections: Maximum live load deflection of roof sheets shall not exceed 1/180<sup>th</sup> span between supports. Maximum deflections shall be based on sheets continuous across two or more supports with sheets fastened and fully free to deflect. Roof purlins shall have a depth not less than 1/40 span. Roof purlins shall have maximum live load deflection not greater than 1/180 span.
- 6. Foundations: Designed per UBC, 1991, with Indiana Amendments and ACI-318, latest revision.

#### 1.5 Submittals

# A. Shop Drawings

For all metal building designs, the shop drawings shall be accompanied by engineering design calculations for structural and covering components, signed by a registered professional engineer licensed to practice in the state where the project is located. For computer programmed designs, shop drawings shall be accompanied by stress values and a certificate, signed by a registered professional engineer licensed to practice in the state of Indiana, stating design criteria and procedures used, listing input-output descriptions, and attesting to the adequacy and accuracy of the design. The shop drawings shall have the following minimum information:

- 1. Indicate wall and roof system dimensions, panel layout, general construction details, anchorage, method of anchorage, and method of installation.
- 2. Indicate framing anchor bolt settings, sizes, and locations from datum and foundation loads.
- 3. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.
- 4. Product Data: Provide data on profiles, components dimensions and fasteners.
- 5. Manufacturer's standard range for each roof and wall profile.
- 6. Manufacturer's Installation Instructions: Indicate preparation requirements and assembly sequence.
- B. Foundations: The foundation drawings shall be accompanied by engineering design calculations signed by a registered professional engineer licensed to practice in the state where the project is located.

#### 1.6 Quality Assurance

A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

# 1.7 Qualifications

- A. Manufacturer: Company specializing in manufacturing the products specified in this specification shall have a minimum of five years documented experience.
- B. Design work and structural components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the state where the Project is located.

# 1.8 Regulatory Requirements

A. Subcontractor shall conform to applicable Uniform Building Code requirements for submission of design calculations, review of shop drawings, and Life, Safety Code requirements for acquiring permit.

B. Subcontractor shall cooperate with regulatory agency or authority and provide data as requested.

# 1.9 Warranty

# A. Building Warranty

All buildings shall be guaranteed against water leaks arising out of or caused by ordinary wear and tear by the elements for a period of five years. Leaks caused by hurricane, lightning, tornado, gale, hail storm or other unusual phenomena shall not be deemed to be ordinary wear and tear by the elements.

# B. Finish

The finish on exterior exposed surfaces of roof and wall sheets and the accessories shall be guaranteed for a period of 20 years against blistering, peeling, cracking, flaking, chalking, and chipping and that the color will not change in excess of 5 N.B.S. units as determined in accordance with ASTM D 2244.

#### PART 2 PRODUCTS

# 2.1 Materials - Framing

- A. Structural Steel Members: ASTM A572, Grade 50.
- B. Structural Tubing: ASTM A500, Grade B
- C. Plate or Bar Stock: ASTM A529.
- D. Anchor Bolts: ASTM A307, galvanized to ASTM A386, Class B.
- E. Bolts, Nuts, and Washers: ASTM A325, galvanized to ASTM A153.
- F. Welding Materials: AWS D1.1; type required for materials being welded.
- G. Primer: SSPC 15, Type 1, Red Oxide.
- H. Grout: Non-shrink type, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 2400 psi in two days and 7000 psi in 28 days.
- Concrete: Per Section 03300.
- J. Concrete Reinforcement: Per Section 03200.

#### 2.2 Materials - Wall and Roof System

- A. Sheet Steel Stock: ASTM A446, Grade A with a galvanized coating conforming to ASTM A525, Grade 90 designation.
- B. Joint Seal Gaskets: Manufacturer's standard.
- C. Fasteners: Manufacturer's standard type, galvanized to ASTM A386 1.25 oz/sq ft finish to match adjacent surfaces when exterior exposed.
- D. Sealant: Manufacturer's standard, non-staining, elastomeric.

# 2.3 <u>Fabrication - Wall and Roof Systems</u>

- A. Siding: shall be 24 gauge minimum metal thickness, with configurations for interlocking ribs for securing adjacent sheets.
- B. Roofing: shall be 24 gauge minimum metal thickness, standing seam configuration. Depth of configuration shall be the building manufacturer's standard provided all design criteria are met.
- C. Soffit Panels: shall be 24 gauge minimum metal thickness, V crimped profile, perforated for ventilation.
- D. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.
- E. Internal & External Corners: Same material thickness and finish as adjacent material, profile (brake formed) shop cut and factory metered to required angles. Back brace metered internal corners with 22 gauge thick sheet.
- F. Expansion Joints: Same material and finish as adjacent material where exposed, 22 gauge thick, (manufacturer's standard brake formed) (infill) type, of profile to suit system.
- G. Flashing, Closure Pieces, Facia, Infills and Caps: Same material and finish as adjacent material, profile to suit system.
- H. Fasteners: To maintain load requirements, and weathertight installation, same finish as cladding, non-corrosive finish.
- I. Ventilator: Gravity type, low profile complete with base, bird screen, hood and flashing.

# 2.4 Finishes

- A. Framing Members: clean, prepare, and galvanize to ASTM A386, Class B.
- B. Exterior Surfaces of Wall and Roof Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected from manufacturer's standard range.

C. Interior Surfaces of Wall and Roof Component and Accessories: Precoated enamel on steel of modified silicone finish, color as selected from manufacturer's standard range.

#### PART 3 EXECUTION

#### 3.1 Examination

- A. Verify site conditions.
- B. Verify that mechanical and electrical utilities are in correct position.

# 3.2 <u>Construction - Foundation</u>

- A. Construct building foundation, backfill and compact as specified.
- B. Verify anchor bolt size, location and projection are per drawings.

# 3.3 <u>Erection - Framing</u>

- A. Erect framing in accordance with AISC Specification.
- B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.
- C. Set column base plates with non-shrink grout to full plate bearing.
- D. Do not field cut or alter structural members without approval of Architect/Engineer.
- E. After erection, prime welds, abrasions, and surfaces not galvanized.

# 3.4 Erection - Wall and Roofing Systems

- A. Install in accordance with manufacturer's instructions
- B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.

- D. Locate end laps over supports. End laps minimum two inches. Place sidelaps over bearing.
- E. Provide expansion joints where indicated.
- F. Use fasteners per manufacturer's recommendations.
- G. Install sealant and gaskets to prevent weather penetration.
- H. System: Free of rattles, noise due to thermal movement and wind whistles.

#### 3.5 Installation - Accessories

Seal wall and roof accessories watertight and weather tight with sealant in accordance with manufacturer's recommendation.

# 3.6 Tolerances

- A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.
- B. Siding and Roofing: 1/8 inch from true position.

#### **END SECTION 13121**

# SECTION 15100 CPVC UNDERGROUND STORAGE TANK

# PART 1 GENERAL

# 1.1 Work Included

- A. This section covers the labor, materials and equipment necessary for the Subcontractor design, purchase and installation of below ground CPVC piping and fittings.
- B. Provide new CPVC thermoplastic piping systems, complete and ready for operation. Piping systems including manufacturer's products shall be in accordance with the standards and codes mentioned in this specification and any applicable local codes and laws having jurisdiction.

#### 1.2 References

The publications listed below form a part of this specification to the extent referenced. Specifications listed refer to the latest edition. The publications are referred to in the text by the basic designation only.

# **AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)**

ASME/ANSI B16.5a Pipe Flanges and Flanged Fittings

ASME/ANSI B16.21 Nonmetallic Flat Gaskets for Pipe Flange

ASME B31.3 Chemical Plant and Petroleum Refinery Piping

# AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 193 Alloy Steel and Stainless Steel Bolting Materials for

High Temperature Service

ASTM A 194 Carbon and Alloy Steel Nuts for Bolts for High

Pressure and High Temperature Service

ASTM C177 Test Method for Steady State Heat flux

Measurements and Thermal Transmission
Properties by Means of the Guarded Hot Plate

Apparatus.

ASTM D 256 Test Method for Impact Resistance of Plastics and

**Electrical Insulating Materials** 

ASTM D 570 Test Method for Water Absorption of Plastics

# **AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)**

(Continued)

ASTM D 635	Test Method for Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position.
ASTM D 638	Test Method for Tensile Properties of Plastics
ASTM D 648	Test Method for Deflection Temperature of Plastics Under Flexural Load.
ASTM D 695	Test Method for Compressive Properties of Rigid Plastics
ASTM D 696	Test Method for Coefficient of Linear Thermal Expansion of Plastics
ASTM D 290	Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 292	Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 1784	Rigid Poly (Vinyl Chloride (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D 2321	Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
ASTM D 2863	Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM F 439	Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
ASTM F 441	Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80
ASTM F 493	Solvents Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings

# 1.3 Submittals

Submit the following information for approval by Contractor:

- A. Manufacturer's Catalog Data
  - 1. Pipe and fittings
  - 2. Valves
- B. Material Safety Data Sheets for materials and solvents.

# PART 2 PRODUCTS

# 2.1 Pipe and Fittings

# A. Design

The pipe and fittings supplied under this specification shall be designed in accordance with ASME B 31.3 and all applicable ASTMs referenced herein.

- 1. Pipe shall have a schedule 80 wall thickness per ASTM F441 and plain ends.
- 2. Fittings shall have a schedule 80 wall thickness and socket ends per ASTM F439.

# B. Materials

- 1. The pipe and fittings supplied under this specification shall be chlorinated poly vinyl chloride (CPVC) material conforming to ASTM D 1784 with a class designation of 23447-B.
- 2. Properties

TABLE 1

(CPVC) CHLORINATED POLYVINYL CHLORIDE

Specific Gravity		ASTM - D792	1.55
Water Absorption	%/24 hrs. @ 73∘ F.	ASTM - D570	.05
Tensile Strength	psi @ 73∘F.	ASTM - D638	8,400
Modules of Elasticity			
in Tension	psi @ 73∘F x 105	ASTM - D638 "E"	4.2
Flexural Strength	psi	ASTM - D790	15,600
izod Impact	78-ft. lbs/in. notched	ASTM - D256	3.0
Compressive Strength	psi	ASTM - D695 "o"	9,000 - 22,000

TABLE 2
(CPVC) CHLORINATED POLYVINYL CHLORIDE

Poison's Ration "v"			.3538
Working Stress	@ 73∘F psi "S"	2,000	
Coefficient of Liner Expansion	in/in ∘F x 105	ASTM - D696 "e"	3.8
Thermal Expansion	inches per 10∘F	change per 100' of pip	e ½"
Resistance to Heat	∘F Continuous		210∘F
Heat Distortion Temp	66 psi	ASTM - D648	238
Heat Distortion Temp	∘F @ 264 psi	ASTM - D648	221
Thermal Conductivity	BTU/hr/sq. ft/∘F/in.	ASTM - C177 "k"	.95
Burning Rate		ASTM - D635	Self Extinguishing
Limiting Oxygen	Index (%)	ASTM - D2863-70	60

TABLE 3

MAXIMUM OPERATING PRESSURES (PSI) AT 73°F AMBIENT

# **CPVC SCHEDULE 80**

Nominal Size	Solvent Weld	Threaded
1/4	1130	-
3/8	920	-
1/2	850	420
3/4	690	340
1	630	320
1-1/4	520	260
1-1/2	471	240
2	400	200
2-1/2	425	210**
3	375	190**
4	324	160**
6	280	N/R
8	250	N/R
10	230	N/R
12	230	N/R

<sup>\*\*</sup> For threaded joint properly backweld with solvent weld.

TABLE 4

# **TEMPERATURE CORRECTION FACTORS**

Operating Temperatures ∘F	<u>CPVC</u>
73	1.00
80	.94
90	.86
100	.78
110	.71
120	.64
130	.57
140	.50
150	.43
160	.37
180	.25
200	.18
210	.16

TABLE 5

# MAXIMUM OPERATING PRESSURE (PSI) FOR FLANGED SYSTEMS

Operating Temperatures •F	CPVC
100	150
110	145
120	135
130	125
140	110
150	100
160	90
170	80
180	70
190	60
200	50
210	40

# C. Workmanship, Dimensions and Markings

- 1. The pipe supplied under this specification shall have the workmanship, dimensions and markings stated in ASTM F441.
- 2. The fittings supplied under this specification shall have the workmanship, dimensions and markings stated in ASTM F439.

# D. Solvent Cements

The solvent cements for chlorinated poly (vinyl chloride) (CPVC) plastic pipe and fittings shall be in accordance with ASTM F493.

# E. Government/Military Procurement

Responsibility for inspection, packaging and marking for US Government Procurement shall be in accordance with the applicable supplementary requirements stated in ASTM F441 and ASTM F439.

# 2.2 Valving

- A. Ball valves, ball check valves and plug valves shall be used.
- B. Valve bodies and bonnets shall be CPVC (ASTM D1784) with viton seats/o-rings or ductile iron bodies with PTFE liner.\*
- C. Pressure temperature rating for 150 psig valves and dimensions shall be manufacturer's standard.
- \* Annular spacer rings are required when mating raised faced PTFE/PFA lined valves to flat faced CPVC flanges. These rings shall be made from PTFE material with dimensions (thickness, inside and outside dimensions) obtained from the valve manufacturer.

# 2.3 <u>Miscellaneous Piping Components</u>

- A. Flanges Class 150
  - 1. Facing dimensions for flanges shall be per ASME/ANSI B16.5.
- B. Gaskets
  - 1. Gaskets shall be 1/8" thick, class 150, full faced, EPDM material per ANSI B16.21.
- C. Bolting
  - 1. Bolting shall be ASTM A 193 Gr. B7 stud bolts, each with two heavy hex nuts, ASTM A 194 Gr. 2H and two SAE stainless steel flat washers.

# 2.4 Transitions

All transitions from CPVC piping and components to metallic piping and components shall be made with flat faced flanges. Threaded adapters shall be utilized only where absolutely necessary.

# PART 3 EXECUTION

# 3.1 <u>Unloading and Handling</u>

Unless otherwise stated, all pipe and fittings shall be unloaded at the point of delivery, moved to the site designated by the Contractor, and distributed as required by the Subcontractor. Unloading of pipe and fittings shall be handled

with reasonable care and effort. A palletized load of pipe shall never be pushed or dragged from a truck bed. Pipe shall not come into severe contact with sharp objects such as corners of truck beds, loading docks and buildings, forks or forklift trucks, and rocks or other obstacles on the ground.

# 3.2 Storage

Pipe shall be stored in a flat dry location to avoid bending and contamination. Palletized pipe should be stacked with wooden pallet bracings touching each other. Fittings shall be stored in their original packaging. The pipe fittings shall be stored in a dry indoor location.

# 3.3 <u>Installation Recommendations</u>

- A. Handling
- B. Because of lower impact resistance than steel, CPVC pipe and fittings shall be handled with care and shall be protected accordingly in high impact areas.
- C. Solvent Cement Welding

The method of joining CPVC pipe and components shall be in accordance with the manufacturer's recommended basic steps. These manufacturer's procedures for preparation, insertion and curing shall be followed. The applicable specification for solvent welding is ASTM F493.

# D. Trench Preparation

Trench excavation, minimum trench width and cover installation guidelines and other key considerations in the underground installation of thermoplastic pipe, shall meet the minimum requirements and guidelines shown in standard practice ASTM D-2321 and final details to be approved by the Contractor.

# E. Allowance for Underground Contraction

Installation and operating temperatures for underground pipelines frequently vary. Allowance for thermal expansion and contraction shall be made by snaking the pipe in the trench. When installation temperature is lower than the operating temperature, the pipe shall be installed in straight alignment and brought up to operating temperature after the joints are cured but before backfilling.

When installation temperature is higher than the operating temperature, the pipe shall be installed by "snaking" in the trench.

#### ALLOWANCE FOR UNDERGROUND CONTRACTION

Loop Length	N	Max. Temp. Variation ∘F Between Installation and Final Operation								
(feet)	100	200	300	400	500	600	700	800	900	1000
			Loop (	Offset Fr	om Trer	nch Cen	terline (I	nches)		
20	3.0	3.5	4.5	5.0	6.0	6.5	7.0	7.0	8.0	8.0
50	7.0	9.0	11.0	13.0	14.0	15.5	17.0	18.0	19.0	20.0
100	13.0	18.0	22.0	26.0	29.0	35.0	35.0	37.0	40.0	42.0

# 3.4 Bedding, Compacting and Backfilling

#### A. General

- 1. The backfilling shall be carried out in accordance with one of the four following sub-sections, or otherwise specified by the Contractor.
- Unless otherwise specified by the Contractor, the haunching and initial backfill shall be compacted before the leakage test, and the remainder of the backfill placed and compacted following a satisfactory test. In all cases the haunching and initial backfill material shall be placed and compacted to provide support as specified by the Contractor.

#### B. Class I and II Materials

The material used for bedding (if required), haunching, and initial backfill shall be graded crushed stone, gravel, or sand containing a maximum particle size of 1-1/2 inches, granular and non-cohesive. It shall be placed in six (6) inch layers and compacted as specified by the Contractor. Care shall be taken to ensure that the haunching is well-placed under the pipe and that the pipe is not moved in the process. These materials need not be used for final backfilling. Unless otherwise specified, the final backfill to finished grade may be the excavated material or other soil, not frozen, and free from voids, lumps of clay, stones, construction debris and boulders over eight (8) inches in their longest dimension, or other unsuitable substances.

#### C. Class III Materials

Class III materials, fine sand, and sandy clay or gravel-clay mixtures shall be used the same as Classes I and II except that the standard proctor density required shall be 80% or more as specified by the Contractor and as determined by the ASTM D698-58T test for compaction and density of soil. This may normally be obtained by walking on soil placed in six (6) inch layers or by hand-tamping same with wooden tampers.

# D. Backfill Under Roads

Trenches in the right-of-way of a road shall be backfilled to finished grade with an approved granular material to a compaction density of 95% of the maximum standard proctor density or as specified by the Contractor. The road surface shall be patched to meet existing thickness and grade.

# E. Backfill Under Dikes

Trenches through dikes, where shown on the applicable drawings shall be backfilled to return the dike to its original condition.

# 3.5 Boring and Jacking

- A. Road crossings, railroad crossings, and crossings of containment dikes may be accomplished by boring and jacking.
- B. Subcontractor shall be responsible for maintaining line and grade of all bored pipelines to within tolerances allowed by industry standards.
- C. Boring equipment pits shall be backfilled to match the original condition of surrounding features.

# PART 4 QUALITY CONTROL

#### 4.1 General

These piping systems including fixtures, equipment, materials, installation, and workmanship shall be in accordance with the ASME B 31.3 Piping Code except as modified herein.

# 4.2 <u>Inspection, Examination and Testing</u>

Inspection, examination and testing of chlorinated poly vinyl chloride (CPVC) piping system shall be in accordance with ASME B31.3, Chapter VII, Part 10.

A. Subcontractor shall inspect and examine all of the CPVC piping system. All testing of this piping system shall be witnessed by the Contractor.

**END OF SECTION 15100** 

# **LIST OF DRAWINGS**

C-100	Master Site/Drainage Plan
C-101	Work Area Paving Layout
C-102	Compost Building Paving Layout
C-103	Office/Lab Area Layout
C-104	Haul Road Layout & Paving Sections
C-105	Work Area Drainage Plan
C-106	Compost Building Area Drainage Plan
C-107	Office/Lab Area Drainage Plan
C-108	South Haul Road - Profile
C-109	Cross Sections - Sheet 1
C-110	Cross Sections - Sheet 2
C-111	Cross Sections - Sheet 3
C-112	Miscellaneous Details
S-100	Decon Area Concrete Plan & Sections
S-101	Decon Area Con Sections & Elevations
S-102	Decon Area Concrete Sections & Details
S-103	Miscellaneous Details
E-100	Electrical - Key Plan
E-101	Electrical - Power Plan
E-102	Electrical - Grounding Plan
E-103	Electrical - Power Details
E-104	Electrical - Lighting Fixture Schedule, B.O.M. & Legend
E-105	Electrical - Typ. Lighting for Bldgs. #1, #2 & #3
E-106	Electrical - Power Details
E-107	Electrical - Schematics & Lighting Details
E-108	Electrical - Typical Grounding Details
E-109	Electrical - Panel Schedules
F-1	Foundation Plan
F-2	Foundation Sections
A-1	Architectural Elevations
A-2	Sump Details
A-3	Joint Detail Plan

t.				

# TASK-SPECIFIC SITE SAFETY AND HEALTH PLAN

# SUPPLEMENT TO WORK PLAN FOR SOLID WASTE MANAGEMENT UNITS #03/10, #10/15, #12/14, #13/14, and SOILS BIOREMEDIATION FACILITY

NSWC CRANE Crane, Indiana

JULY 19, 1996 Revision 1

CONTRACT #N62467-93-D-1106 DELIVERY ORDER #0009 STATEMENT OF WORK #0007

# Prepared For:

SOUTHERN DIVISION
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19				

SEC	TION	PA	GE
1.0	INTR	ODUCTION	. 1
	1.1	WORK TASK SUMMARY	. 1
	1.2	CONTAMINANT CHARACTERISTICS	. 2
	1.3	REFERENCES	. 2
2.0	SAFE	ETY AND HEALTH HAZARDS SUMMARY	. 4
	2.1	OVERVIEW	
	2.2	ACTIVITY HAZARD ANALYSES	. 4
	2.3	CHEMICAL HAZARDS	. 5
	2.4	BIOLOGICAL HAZARDS	. 5
	2.5	CONSTRUCTION SAFETY HAZARDS	. 5
		2.5.1 Physical Hazards	. 5
		2.5.2 Noise	. 5
		2.5.3 Adverse Weather Stress	. 5
		2.5.4 Excavations	. 6
		2.5.5 Overhead Power Lines	. 7
		2.5.6 Hazardous Energy Control (Lockout/Tagout)	. <b>7</b>
		2.5.7 Fire and Explosion	. 7
		2.5.8 General Motor Vehicle, Hand and Power Equipment Safety	. 8
		2.5.9 Vehicular Traffic and Work-Site Control Hazards	. 8
		2.5.10 Clearing and Grubbing	. 9
		2.5.11 Access and Haul Roads	. 9
3.0	RESP	PONSIBILITIES AND AUTHORITIES SUMMARY	10
	3.1	MK PROJECT MANAGER (PM)	
	3.2	MK GENERAL SUPERINTENDENT AND SUBCONTRACTOR JO	
		SUPERVISORS	10
	3.3	MK CERTIFIED INDUSTRIAL HYGIENIST (CIH)	11
	3.4	MK SITE SAFETY AND HEALTH OFFICER (SSHO)	
	3.5	SUBCONTRACTOR DESIGNATED COMPETENT SAFETY PERSON	
	3.6	SUBCONTRACTOR PERSONNEL	11
	3.7	NEAREST EMERGENCY MEDICAL FACILITY	12
4.0	TRAII	NING REQUIREMENTS SUMMARY	13
	4.1	HAZARDOUS WASTE OPERATIONS TRAINING	13
	4.2	SITE SPECIFIC TRAINING	13
	4.3	CONFINED SPACE ENTRY TRAINING	
	4.4	RESPIRATORY PROTECTION TRAINING	
	4.5	HAZARD COMMUNICATION TRAINING	
	4.6		

<u>Sect</u>	<u>ion</u>	<u>P</u> :	<u>age</u>
	4.7	DEPARTMENT OF TRANSPORTATION (DOT)	
		HAZARDOUS MATERIALS	15
	4.8	INORGANIC LEAD TRAINING	15
	4.9	CADMIUM TRAINING	15
	4.10	INORGANIC ARSENIC TRAINING	16
	4.11	SAFETY MEETINGS	16
	4.12	PLAN OF THE DAY (POD) MEETINGS	16
	4.13	PRE- AND POST-ENTRY BRIEFINGS (MEETING)	
	4.14	<b>QUALITY CONTROL PREPARATORY PHASE INSPECTION MEETIN</b>	<b>G</b> 17
	4.15	RECORDKEEPING	17
5.0	MEDI	CAL SURVEILLANCE PROGRAM REQUIREMENTS	18
0.0	5.1	SUMMARY	
	5.2	DRUG ABUSE PREVENTION PROGRAM	
	5.3	RECORDKEEPING	
<b>.</b> .	DEDC	ONAL PROTECTIVE EQUIPMENT	20
6.0	PERS	SONAL PROTECTIVE EQUIPMENT	20
7.0		TORING AND SAMPLING	
	7.1	GENERAL	22
	7.2	MONITORING	22
		7.2.1 Volatile Organic Compounds	22
		7.2.2 Airborne Dust	
		7.2.3 Confined Space Monitoring	23
		7.2.4 Perimeter Monitoring	24
		7.2.5 Noise Monitoring	
		7.2.6 Heat Stress and Cold Stress Monitoring	
		7.2.7 Carbon Dioxide, Hydrogen Sulfide, and Other Chemi	
		Monitoring	
	7.0	7.2.8 Ionizing Radiation Monitoring	
	7.3	AIR SAMPLING	
		7.3.1 Organic Compounds	
		7.3.2 Metals	
		·	
		7.3.4 Biological Hazards	
	7.4	7.3.5 Wipe Sampling for Explosives Residues and Metals	
	7.4 7.5	AIR MONITORING AND SAMPLING REQUIREMENTS	
-	1.3	NEOCIDILE ING AND CHAIR OF COSTODI	30
8.0	GENE	ERAL SAFETY RULES AND PROCEDURES	31
	8.1	GENERAL	31

<u>Sect</u>	ion		<u>Page</u>		
	8.2	RULES AND PROCEDURES	31		
9.0	WORK ZONES				
	9.1	EXCLUSION ZONE (EZ)			
	9.2	CONTAMINATION REDUCTION ZONE (CRZ)			
	9.3	SUPPORT ZONE (SZ)			
	9.4	CONSTRUCTION ZONE			
	9.5	WORK ZONE CONTROLS			
10.0	PERS	SONNEL AND EQUIPMENT DECONTAMINATION			
		HYGIENE PROCEDURES			
	10.1 E	EMERGENCY PERSONNEL DECONTAMINATION			
	10.2	PERSONNEL DECONTAMINATION			
	10.3	EQUIPMENT DECONTAMINATION			
	10.4	WASHING FACILITIES			
	10.5	DECONTAMINATION WASH WATER			
	10.6	SANITATION AND PERSONAL HYGIENE	. 38		
11.0		ITE FIRST AID AND EQUIPMENT			
	11.1	FIRST-AID AND MEDICAL FACILITIES REQUIREMENTS			
	11.2	REPORT OF FIRST AID CASES	. 39		
12.0	EMER	RGENCY RESPONSE PLAN AND CONTINGENCY PROCEDURES	. 40		
	12.1	PRE-EMERGENCY PLANNING			
	12.2	RESPONSIBILITIES			
		12.2.1 Project Personnel			
		12.2.2 Project Manager			
		12.2.3 MK Certified Industrial Hygienist (CIH)			
		12.2.4 MK Site Safety and Health Officer (SSHO)			
		12.2.5 Subcontractors			
	12.3	EMERGENCY RECOGNITION AND PREVENTION	•		
		SAFETY ZONES			
		SITE SECURITY AND CONTROL			
		EVACUATION ROUTES			
	12.7				
	-	EMERGENCY MEDICAL TREATMENT AND FIRST AID			
		COMMUNICATIONS			
		CRITIQUE OF RESPONSE AND FOLLOW-UP			
•	12.11	INITIAL REPORTING AND MANAGEMENT OF INCIDENTS	. 43		
13.0	LOGS	S, REPORTS, AND RECORDKEEPING	. 46		

<u>Sect</u>	<u>ion</u>		<u>Page</u>
	13.1	SAFETY AND HEALTH LOGBOOK	46
	13.2	REPORTS	46
	13.3	FIELD MASTER COPY OF SSHP	46
	13.4	RECORDKEEPING	46
	13.5	SAFETY AND HEALTH PROJECT COMPLETION REPORT	47
14.0	ON-S	ITE WORK PLANS	48
15.0	COM	MUNICATION PROCEDURES	49
	15.1	RADIO COMMUNICATION, TELEPHONE, ALARMS	AND
		DRILLS/EXERCISES	49
16.0	SPILL	CONTAINMENT PLAN	50
	16.1	GENERAL	. 50
	16.2	PREPLANNING FOR SPILL CONTROL	. 50
	16.3	SPILL AND FIRE CONTROL MATERIALS AND EQUIPMENT	51
	16.4	SPILL CONTROL MEASURES	51
	16.5	DRUM, CONTAINER, AND TANK HANDLING AND	
		MOVING PROCEDURES	51
	16.6	INITIAL REPORTING AND MANAGEMENT OF INCIDENTS	. 52
17.0	CONF	INED SPACES	54

# **LIST OF TABLES**

TAB	LE PAGE
1 2 3 4 5 6 7 8 9	Site Description and Contaminants
	LIST OF FIGURES
FIGU	JRE PAGE
1 2 3 4 5	Directions to Nearest Emergency Medical Facilities
	APPENDICES
APP	ENDIX
A B	ACTIVITY HAZARDS ANALYSIS (AHA)

# 1.0 INTRODUCTION

This Task-Specific Site Safety and Health Plan (SSHP) describes safety and health requirements for interim cleanup measures at NSWC Crane, specifically for Solid Waste Management Units (SWMUs) #03/10, #10/15, #12/14, AND #13/14 and the Soils Bioremediation Facility. This SSHP is consistent with requirements of the Occupational Safety and Health Administration's (OSHA) Hazardous Waste Site Regulations; 29 CFR 1910.120 and 29 CFR 1926.65; and the U.S. Army Corps of Engineers (ACOE) Safety and Health Requirements Manual EM 385-1-1, dated October 1992. This SSHP is applicable to all personnel who enter work areas described in this SSHP and who are under the control of Morrison Knudsen Corporation (MK) or MK's Subcontractors.

# 1.1 WORK TASK SUMMARY

**SWMU #03/10 Ammunition Burning Ground (ABG)** - The scope of work includes excavation, removal, and screening (includes rock washing) of approximately 60,000 cubic yards of soil contaminated with explosives residuals, volatile organics, heavy metals, pesticides and herbicides; transport to the Soils Bioremediation Facility; soil sampling; decontamination; and site restoration.

**SWMU #10/15 Rockeye -** Excavation, removal, and screening (includes rock washing) of approximately 18,000 cubic yards of explosives-residual contaminated soil, transport to the Bioremediation Facility, soil sampling, decontamination, and site restoration.

**SWMU #12/14 Mine Fill A -** Excavation, removal, and screening (includes rock washing) of approximately 11,000 cubic yards of explosives-residual contaminated soil, transport to the Bioremediation Facility, soil sampling, decontamination, and site restoration.

**Facility #12/13 Mine Fill B -** Excavation, removal, and screening (includes rock washing) of approximately 22,000 cubic yards of explosives-residuals and heavy-metals contaminated soil, transport to the Bioremediation Facility, soil sampling, decontamination and site restoration.

**Soils Bioremediation Facility** - Facility to be constructed east of Bunker 828 which is located on H-280 just off H-54. Explosives contaminated soils will be received at this facility from on-site SWMUs. The contaminated soil will be processed by mixing with amendments and composting in covered structures. Support subsystems include decontamination facilities; stormwater diversion and retention controls; and office and laboratory trailers.

Amendments that will be mixed with the contaminated soils include alfalfa and animal manure. Amendments will be loaded into a grinder/mixer and will either be stored or discharged directly into the composting building for formation of the windrows (refer to

Operational Plan, MK 1996f). Construction activities will include site preparation; installation of a sloped compost pad with collection sumps; construction of three temporary Butler buildings on the pad with necessary utilities; temporary office facilities and work areas; decontamination pad; installation of soil processing equipment. The scope of work is summarized in Table 1. Detailed task descriptions are provided in Section 4.0 of the Work Plan.

# 1.2 CONTAMINANT CHARACTERISTICS

The potential contaminants for each SWMU and the Soils Bioremediation Facility are summarized below. Material Safety Data Sheets (MSDSs) or National Institute for Occupational Safety and Health (NIOSH) Pocket Guides will be used as a source of information to help personnel recognize and control occupational chemical hazards. MSDS and NIOSH information for each of the potential contaminants, process chemicals, or other chemical substances encountered during the interim cleanup process will be organized into a separate binder, commonly called the "MSDS Binder." These binders will be available to all personnel, at anytime, and will be at appropriate on-site locations such as the MK job-site trailer, NSWC Medical Building, and each active work area. Additional information concerning potential contaminants is presented in Table 2. The potential contaminants contained in the soils to be received at the Soils Bioremediation Facility are summarized below for each SWMU.

**SWMU #03/10 Ammunition Burning Ground (ABG)** - Soil containing residues of 2,4-DNT, 2,6-DNT, TNT, Tetryl, DNB, RDX and HMX. Soils were also determined to contain various metals, pesticides, and herbicides. Groundwater was determined to be contaminated with RDX, HMX, and TNT, the organics trichloroethene (TCE) and tetrachloroethene, and barium.

**SWMU #10/15 Rockeye -** Soil containing residues of TNT, HMX and RDX. Metals, cyanide, methylene chloride and PCBs are all below TCLP action levels.

**SWMU #12/14 Mine Fill A** - Soil containing residues of TNT, HMX and RDX.

**Facility #12/13 Mine Fill B** - Soil containing residues of TNT, HMX, and RDX. 2,4-DNT and TNB were detected only in one sample. Metals include antimony, beryllium, arsenic, cadmium, chromium, lead, copper, nickel, zinc, barium, aluminum, cobalt, iron, and magnesium.

# 1.3 REFERENCES

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# 2.0 SAFETY AND HEALTH HAZARDS SUMMARY

# 2.1 OVERVIEW

Hazards at this site include construction safety hazards associated with heavy equipment; soil excavation and penetrations, and potential contact with underground utilities and undermining of structural supports in Mine Fill A and B; inclined walking and working surfaces; traffic control including haul road layout; energy control (electrical and other kinetic energy sources) or other utility lines; site restoration including backfilling and compaction; eye/head/feet physical hazards; and heat and cold stress.

During construction of the Bioremediation Facility, the potential risk of acute exposure to chemical contaminants is considered low. During operations, the potential risk of acute exposure to the chemical contaminants listed in Table 2 is considered low if the engineering controls, administrative controls, and personal protective equipment (PPE) requirements are strictly adhered to. The highest risk chemical contaminants are TNT and RDX. Controls in place for the explosives will also meet or exceed the controls necessary for protection from the heavy metals.

The Soils Bioremediation Facility processing equipment must be designed and operated to minimize dust release and safeguarded to prevent employee contact with rotating equipment. General facility ventilation at the rate of 6 air changes per hour is required in the Bioremediation buildings when the facility is "closed up" to protect against high levels of carbon dioxide buildup or other gases and vapors, otherwise, no general facility ventilation is expected to be required when the open mesh building cover's are in place. Hazards associated with the man-machine interface for process equipments will be analyzed when more information becomes available on the procured equipment. Potential biological hazards may include bioaerosols such as bacteria, molds, yeast, and fungi.

# 2.2 ACTIVITY HAZARD ANALYSES

AHA have been prepared for each anticipated task in accordance with EM 385-1-1, October 1992 (ACOE, 1992). These hazard analyses are in the form of worksheets contained in Appendix A of this SSHP. Each site activity shall be reviewed by field supervision, namely the MK Site Safety and Health Office (SSHO), MK General Superintendent and Subcontractor Job Supervisors(s) prior to starting work to determine if the prepared AHA adequately addresses the planned activity. If the prepared AHA requires revision or a new task is identified, additional hazard analysis will be prepared as needed. A new AHA worksheet shall be field prepared by the Subcontractor Job Supervisor and the MK SSHO before the activity takes place. The Pre-Entry Briefing meeting is utilized to review the AHA and is conducted with all affected workers by the Subcontractor Job Supervisor.

# 2.3 CHEMICAL HAZARDS

The potential chemical contaminants, their exposure limits, sign and symptoms of overexposure, and first aid requirements are presented in Table 2.

# 2.4 BIOLOGICAL HAZARDS

Use caution and assess work areas for insect, snake and biohazard plant life. The MK SSHO shall meet with Base representatives and medical personnel to discuss potential concerns at the SWMU locations during mobilization. Potential biological hazards includes bacteria, molds, yeast and fungi which may be present in airborne concentrations greater than background at the Bioremediation Facilities during the composting process.

# 2.5 CONSTRUCTION SAFETY HAZARDS

# 2.5.1 Physical Hazards

Physical hazards on this project include the use of heavy equipment such as dump trucks, backhoes and excavators and process equipments; and tripping and slipping from walking and working surfaces. Project personnel will receive site-specific and safety training, discussed later, to orient them to these potential hazards.

# 2.5.2 Noise

Operations may generate noise levels that exceed allowable limits. Hearing protection shall be provided for all field personnel, and its use is required when noise levels exceed 85 decibels A weighted network {dB(A)} steady state or 140 dB(A) impulse, regardless of the duration of exposure. Hearing protection will be provided to all field personnel. A comprehensive Hearing Conservation Program will be implemented when noise levels equal or exceed 85 dBA on an 8-hour time weighted average. Exposure assessments will be conducted by the MK SSHO throughout the work campaign.

# 2.5.3 Adverse Weather Stress

All employees are to be alert to the signs and symptoms of heat stress. Should extreme fatigue, cramps, dizziness, headache, nausea, profuse sweating, rapid pulse, or pale clammy skin occur, the employee is to immediately leave the work area, rest, cool off, and drink plenty of cool water. If the symptoms do not subside after a reasonable rest period, the employee shall notify the supervisor, who in turn will notify the MK SSHO and seek medical assistance. The MK SSHO and the site supervisor will be alert to signs of heat stress in site personnel and increase the frequency of breaks and fluid consumption as necessary.

Cold injury is classified as either localized, as in frostbite, frost nip or chilblain, or generalized, as hypothermia. In judging the cold hazard, both air temperature and wind

chill factor must be considered. The first symptoms of hypothermia are uncontrolled shivering, the sensation of being cold; the heartbeat slows and sometimes becomes irregular; the pulse weakens and blood pressure changes. Severe shaking or rigid muscles caused by bursts of energy change the body chemistry. Vague or slowed speech occurs; memory lapses, incoherence and drowsiness then occur. As core temperature continues to drop, listlessness, confusion and little attempt to keep warm commences. Pain in the extremities is felt. As exhaustion sets in, the body's ability to contract blood vessels is diminished, and rapid loss of heat and cooling begins.

Frostbite can occur without hypothermia when the extremities do not receive sufficient heat from central body stores. This can occur because of inadequate circulation and/or insulation. This condition results in damage to and loss of tissue. The most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes. Damage from frostbite can affect the outer layer of skin only, or it can include the tissue beneath the outer layer. Damage from frostbite can be serious; scarring, tissue death and amputation are all possibilities. The symptoms of frostbite include: 1) The skin changes color to white or grayish-yellow, progresses to reddish-violet and turns black as tissue dies; 2) Pain may be felt at first, but subsides; 3) Blisters may appear; 4) The affected part is cold and numb; and 5) The skin has a waxy appearance.

To prevent cold stress, proper clothing must be worn. It is important to preserve the air space between the body and the outer layer of clothing to retain body heat. Refer to Section 7.2.6 for more guidance on heat and cold stress management.

# 2.5.4 Excavations

Open excavations and trenches present a hazard from falling into the excavation and/or side wall collapse while personnel are near or inside the excavation. To minimize exposure risk, the excavation work site will be barricaded with orange snow fence and signs posted. Refer to MK Project Procedure PHSP 05.1 for specific excavation requirements. The deepest excavation on this project may approach eight feet but the majority of excavations should be approximately 5 feet. OSHA 1926.650 Subpart P - Excavations and Corps of Engineers requirements (EM 385-1-1, Section 25) requirements for sloping or shoring will apply.

Positive identification of underground utilities and services is required at least 24 hours prior to any excavation, trenching or penetrations. An Excavation and Trenching Permit application must be submitted at least seven days prior to any excavation activities. The MK Project Manager (PM) will be responsible for obtaining this permit through the NSWC Crane Public Works Department (PWD). The Subcontractor shall coordinate preparation of the application and associated drawings with the MK General Superintendent. Regardless of the size of the trench, the Subcontractor shall designate a competent person who will evaluate all excavations and trenches on a daily basis regardless of whether personnel will enter. Inspection shall be recorded in a log book.

#### 2.5.5 Overhead Power Lines

Overhead high-voltage lines present an electrocution hazard. Work conducted in proximity of overhead power lines will be performed in accordance with the requirements in EM 385-1-1, Section 11.E.

# 2.5.6 Hazardous Energy Control (Lockout/Tagout)

Ground Fault Circuit Interrupters (GFCIs) will be installed on all portable electrical equipment and installations in accordance with EM 385-1-1 Section 11.C.05. All extension cords shall have GFCI protection and shall be inspected and determined to be free of cracks or frays.

Any system where the potential exists for unexpected energizing, start-up, or release of kinetic or stored energy during servicing and maintenance resulting in injury or damage shall be energy isolated in accordance with EM 385-1-1 Section 12, 29 CFR 1910.147, and PHSP 01.1. The MK Site Superintendent shall be responsible for verifying adequacy of all lockout/tagout installations and notifying all affected personnel. The MK Site Superintendent and the Subcontractor Supervisor have the responsibility for implementing energy control measures. The PWD will provide energy control services which will be coordinated by MK Site Superintendent. The Subcontractor will initiate all energy control requests to MK three working days in advance of anticipated work commencement.

In addition, energy controls apply to motorized heavy equipment and process equipments and the following requirement applies. At a minimum, during service and maintenance of motorized equipment, the key shall be removed and in possession of the service or maintenance person and a "Do Not Operate" tag signed by this person shall be displayed near the start-up controls. Pre-operational checks and maintenance requirements on process equipments, including energy control will be incorporated into checklists.

# 2.5.7 Fire and Explosion

An Unexploded Ordnance Survey (UXO) will be required prior to subcontractor mobilization and may continue throughout the excavation process. The UXO Survey will be conducted by NSWC personnel.

No hot work or open flames will be allowed in the work area without a Hot Work Permit obtained through the MK SSHO. Hot Work Permitting will be coordinated through the base Fire Department. Flammable and combustible fuels for heavy equipment shall be stored and dispensed in accordance with NFPA 30, the Flammable and Combustible Liquids Code. At least two 20 lb or equivalent "ABC" multi purpose fire extinguisher shall be maintained for fire response at the entrance to each Contamination Reduction Zone (CRZ). Fire extinguishers will be located at the diesel fuel storage location and in each of the Composting Buildings. All mobile heavy equipment must be fitted with a minimum 10 lb "ABC" fire extinguisher. Any temporary trailers or structures must have fire extinguishers

installed in accordance with NFPA 10. Depending on the fire loading, in most cases a 5 lb "ABC" is sufficient in each office trailer. This extinguisher must be mounted at least four feet from the floor next to a egress door. The MK SSHO is responsible for completing monthly checks on the fire extinguishers and recording appropriately. Use of any tool that can be considered an ignition hazard where fire and explosion hazards may exist is strictly prohibited. Portable power tools shall be explosion proof in accordance with NFPA 70B and 70E, Class 1, Division 1, Group D or otherwise approved for use in potentially explosive atmospheres.

# 2.5.8 General Motor Vehicle, Hand and Power Equipment Safety

The following traffic rules will apply to all motorized vehicles and equipment while on site:

- Equipment carrying waste shall <u>always</u> have the right-of-way within the Work Zones.
- The speed limit is <u>10 mph</u>, or as posted. Exceeding the speed limit is cause for disciplinary action, including removal from the site.
- Personnel shall <u>not</u> ride equipment that has not been specifically designed for the transport of personnel.
- Seatbelts shall be worn at all times when operating any motorized equipment or vehicle.
- All motor vehicles and equipment including hand and power tools shall be subject to an incoming safety inspection by the MK SSHO. The MK SSHO reserves the right to reject any subcontractor equipment. A "DO NOT USE" or "DEFECTIVE" tag will be placed on the equipment and documented in the MK SSHO Logbook. Corrective action will be pursued with the Subcontractor Supervisor.
- Daily safety checklists shall be completed by heavy equipment operators and delivered to the MK Site Project Office on a daily basis. The checklist should be based on the equipment manufacturers recommended guidelines for daily checks using a format established and prepared by the Subcontractor (if applicable) and approved by the MK SSHO. Appendix C to this plan will contain copies of all checklists.

# 2.5.9 Vehicular Traffic and Work-Site Control Hazards

Potential hazards from vehicular traffic around work areas including the Soils Bioremediation Facility will be controlled by using traffic control items such as traffic cones, flagging, barricades, and signs. Types and placement of traffic control items will be in accordance with EM 385-1-1, Section 8 and 29 CFR 1926.201 and 202. Workers required to work in active traffic areas or roadways will be required to wear high visibility reflective vests.

# 2.5.10 Clearing and Grubbing

Clearing and grubbing of any work site shall be completed in accordance with the requirements of EM 385-1-1 Section 31. All tree and shrub removal equipment, either hand or power tool shall be inspected on a daily basis by the Subcontractor Job Supervisor. The correct equipment shall be chosen for the job, all operators shall be trained in safe operation, and the correct PPE selected.

# 2.5.11 Access and Haul Roads

If special access and haul roads are required and constructed for this project, they will be constructed in accordance with EM 385-1-1 Section 21.I.

# 3.0 RESPONSIBILITIES AND AUTHORITIES SUMMARY

This section describes the roles and responsibilities of project personnel with regard to safety and health. Ultimately, responsibility for the safety and health lies with the individual. All personnel must be cognizant of the hazards and the methods of reducing the risk of injury and illness. All personnel will comply with the rules and procedures set forth in this plan and will make project management aware of any conditions which may jeopardize the welfare of project workers and/or the general public. The specific personnel names and telephone numbers of responsible persons are presented in Table 3. Figure 1 is the route map to the nearest medical facilities which also shows the NSWC Base layout.

# 3.1 MK PROJECT MANAGER (PM)

The PM is responsible for the management of all aspects of the project, including safety and health. The PM is responsible for ensuring that all project tasks receive appropriate safety and health review before commencement of field activities and that the necessary equipment and facilities are available to implement the SSHP.

# 3.2 MK GENERAL SUPERINTENDENT AND SUBCONTRACTOR JOB SUPERVISORS

The MK General Superintendent and the Subcontractor Job Supervisor(s) are responsible for ensuring that the safety and health aspects for their particular task are addressed. They are responsible for the implementation of the SSHP in the field and for ensuring that all project personnel comply with provisions of the plan. The MK General Superintendent and Subcontractor Job Supervisor(s) are also responsible for notifying the MK SSHO of any changes in work conditions which may affect the safety and health aspects of the task. The MK General Superintendent is responsible for conducting Plan of the Day (POD) meetings. The Subcontractor Job Supervisor(s) are responsible for conducting Pre-Entry Briefings and Post Entry Briefings when required.

The Subcontractor Job Supervisor(s) must notify the MK SSHO and MK General Superintendent of all accidents and incidents as soon as possible. The Subcontractor Job Supervisor(s) shall conduct an accident investigation and record the results of the investigation on a Supervisor Accident Investigation Report form or equivalent form. The initial investigation report shall be formally transmitted to the MK Project Manager within four hours after critical management of the incident is complete. The MK Project Manager shall follow the reporting requirements described in PHSP 04.1. The MK General Superintendent shall conduct a critique of the incident with selected MK and Subcontractor personnel as soon as possible after critical management of the incident is complete. Lessons learned will then be developed by the MK General Superintendent and Subcontractor Job Supervisor(s) and communicated to all affected personnel.

# 3.3 MK CERTIFIED INDUSTRIAL HYGIENIST (CIH)

The MK CIH who is the MK Project Management Office (PMO) Health and Safety Manager is responsible for preparation of the SSHP. The CIH is based out of the Boise, ID office. The CIH is responsible for making modifications to the plans and recommending changes to the work tasks if they affect safety and health. The CIH is responsible for ensuring that all required sampling/monitoring is performed and that all required safety and health documentation is maintained. The CIH may assign some tasks to the MK SSHO for implementation.

# 3.4 MK SITE SAFETY AND HEALTH OFFICER (SSHO)

The MK SSHO is responsible for the day-to-day implementation of the SSHP, and verification of compliance with the SSHP and all applicable occupational safety and health rules and regulations. The SSHO has the authority to suspend work at any time if there is an imminent threat to the health and safety of project workers or the general public. The SSHO shall assure the Navy's designated authority at the site is notified immediately of any accident including spills. The SSHO shall assist in the accident investigation effort and shall have final approval authority for accident reports. The MK Work Plan document describes in detail the role and responsibilities of the SSHO on this project.

# 3.5 SUBCONTRACTOR DESIGNATED COMPETENT SAFETY PERSON

Each Subcontractor shall designate a competent and qualified person, subject to the approval of the MK SSHO and the MK Site Project Engineer, responsible for the implementation of this SSHP and their Company's safety and health program. This designated person shall be referred to as the Subcontractor SSHO. The Subcontractor SSHO shall provide a daily site safety report and shall coordinate his efforts with the MK SSHO.

# 3.6 SUBCONTRACTOR PERSONNEL

All Subcontractors are required to have a qualified designated competent safety person who will assure and abide by the requirements of this SSHP as stated above. They are also required to comply with all applicable and appropriate federal, state, and local laws, standards, and regulations. Subcontractors must notify the MK SSHO and MK General Superintendent of all accidents as soon as possible. Subcontractors must maintain records of all first aid rendered and recordable, and lost time injuries. Subcontractors must notify the MK SSHO of any changes in work conditions which may affect the safety and health aspects of the task.

# 3.7 NEAREST EMERGENCY MEDICAL FACILITY

# **Directions to the On-Site NSWC Medical Department:**

The NSWC Fire Department coordinates the on-site ambulance service. The Medical Department is located in Building 12, off of road H-2, just north of H-5.

# **Directions to Bedford Medical Center:**

From the Bedford Gate, head east on Highway 158 to the city of Bedford, 158 turns left onto 16th Street. The distance to hospital is approximately 20 miles.

# **Directions to 16th Street:**

Exit NSWC on road H5-45 through the Bloomington Gate, then follow Highway 45 North to Bloomington. At the intersection of Highway 45 and Highway 37, continue straight ahead and follow Bloomfield Road north until it becomes 2nd Street. Continue on 2nd Street; the hospital will be on right-hand side of the road.

# 4.0 TRAINING REQUIREMENTS SUMMARY

This section summarizes training requirements for project personnel. For the Soils Bioremediation Facility, modifications to training requirements are permitted for clean new construction. Training requirements identified in paragraphs 4.1, 4.3, 4.4, 4.7, 4.8, 4.9, 4.10 are not applicable for Bioremediation Facility construction. A training requirements summary is provided as Table 4.

# 4.1 HAZARDOUS WASTE OPERATIONS TRAINING

All personnel entering a contamination reduction zone or exclusion zone shall have completed the initial 40-Hour Hazardous Waste Operations Safety and Health Training and three days of supervised experience pursuant to 29 CFR 1910.120(e)(3). All personnel shall receive eight hours of refresher training annually, pursuant to 29 CFR 1910.120(e)(8), as necessary. All on-site supervisors and managers as well as subcontractor superintendents and foremen shall receive an additional eight hours of specialized training pursuant to 29 CFR 1910.120(e)(4).

# 4.2 SITE SPECIFIC TRAINING

All personnel shall receive site-specific safety and health training prior to entering the site or commencement of work. All site employees and subcontractors, including those working in the support zone, shall receive this training. The Subcontractor Job Supervisor(s) are responsible for identifying personnel requiring this training and coordinated with the MK SSHO regarding scheduling of this training. The MK SSHO or designated alternate will conduct the training. Site visitors shall receive site-specific training prior to entering an exclusion zone. An abbreviated version of this training will be given to site visitors not entering an exclusion zone but whose business will be conducted unescorted in the near vicinity of the Work Zones. The format and content will be left up to the discretion of the MK SSHO. This training will cover the SSHP, but not necessarily be limited to, the following topics:

- Names of site safety and health personnel.
- Safety and health hazards present on the site and anticipated during the work campaign.
- Hazard Communication.
- PPE requirements.
- Safe work practices including drum handling.
- Engineering controls.
- Medical surveillance requirements, including recognition or symptoms and signs which might indicate overexposure to hazards.
- Decontamination procedures.

- Emergency procedures.
- Spill containment plan.
- Confined Space Entry.
- Energy Control.
- All other requirements of this SSHP.

# 4.3 CONFINED SPACE ENTRY TRAINING

If excavations greater than 5 foot deep are to be entered, the excavation shall be treated initiated as a permit confined space until authorized to be downgraded to non permit confined space in accordance with MK Industrial Hygiene (IH) Procedure Number 9 and 29 CFR 1910.146. These initial precautions are established because of the potential for organic vapor accumulation in the excavation. Downgrading is based on initial and periodic air monitoring to insure the breathing atmosphere is safe or can be maintained safe by ventilation equipment, and engineering controls in place to safeguard the excavation from collapse.

If permit required confined space designations are made, then personnel involved with confined space entry work shall be required to have certified documented training in confined space entry procedures in accordance with the requirements of 29 CFR 1910.146. Copies of certificates must be presented to the MK SSHO prior to commencing work. Confined space entry procedures shall be implemented by the MK SSHO in accordance with MK IH Procedure 9. An MK Confined Space Entry Permit shall be posted at each work site during permit confined space entry activities. The Base Fire Department shall be notified of the location of confined space entries and expected duration at least two hours in advance of entry by the MK SSHO.

# 4.4 RESPIRATORY PROTECTION TRAINING

All MK personnel and Subcontractors required to use respiratory protection shall have certified training in respirator use, care and maintenance pursuant to 29 CFR 1926.103 and 29 CFR 1910.134. Each individual shall be medically qualified to wear a respiratory device and have documented evidence of successfully completing respiratory training and fit testing.

# 4.5 HAZARD COMMUNICATION TRAINING

All personnel shall complete hazard communication training pursuant to 29 CFR 1910.1200 and 29 CFR 1926.59 regarding all potentially hazardous chemicals to which they may be exposed. In the event that the OSHA regulations regarding other contaminants or hazards become applicable, substance-specific training pursuant to the subject regulation will be performed for the affected project personnel.

Each subcontractor shall have a written Hazard Communication Program in accordance with OSHA's Hazard Communication Standard, 29 CFR 1910.1200 and applicable State

Department of Health Regulations. Material Safety Data Sheets (MSDS) for all hazardous materials in the work area shall be readily available for employees to review. MSDSs and/or NIOSH Pocket Guides for the contaminants suspected to be in the various work sites will be placed in a site MSDS Right-To-Know Binder. Copies will be maintained at each work site or some location convenient for employees to review plus a copy will be kept at the MK Project Office and the Subcontractor(s) Project Office.

Hazard Communication training will be included as part of the Site-Specific Training required in Section 4.2. When new chemicals are brought onto the work site or new chemical contaminants are identified, an MSDS and/or NIOSH Pocket Guide will be added to the MSDS Right-To-Know Binder(s) with a corresponding review by the MK SSHO and Subcontractor Job Supervisor(s) and if necessary, training shall be conducted with affected individuals. The MK SSHO has overall responsibility for maintenance of the MSDS database. Subcontractors are responsible for notifying the MK SSHO of new chemicals or substances being used in the work place. Subcontractor Job Supervisor(s) are responsible for reviewing the MSDS, identifying training needs for affected workers and transmitting a copy of the MSDS to the MK SSHO.

#### 4.6 CPR/FIRST AID AND BLOOD BORNE PATHOGENS

At least two employees on each shift shall be qualified to administer First Aid and CPR. At the minimum, the MK SSHO and each Subcontractor shall have at least one person First Aid/CPR qualified. These personnel are also required to be trained to 29 CFR 1910.1030 (BLOOD BORNE Pathogens). Trained First Aid and CPR personnel shall be identified by hard hat stickers or other means of identification.

# 4.7 DEPARTMENT OF TRANSPORTATION (DOT) HAZARDOUS MATERIALS TRAINING

All personnel required to classify, mark, select packaging, inspect, load and transport hazardous materials must be trained to 49 CFR 172 Subpart H. This includes personnel responsible for packaging of samples to be sent to off site laboratories for analysis. Also included are personnel responsible for completing a hazardous waste or hazardous material manifest and insuring the hazardous waste/material is properly prepared for off site shipment.

# 4.8 INORGANIC LEAD TRAINING

All personnel working on any of the SWMUs where inorganic lead contamination could be present shall receive training on the OSHA Lead Standard, 29 CFR 1926.62.

## 4.9 CADMIUM TRAINING

All personnel working with contaminated soil from SWMUs #03/10 and #10/15, where cadmium contamination is present, shall receive training on the OSHA Cadmium Standard, 29 CFR 1926.63 and 1910.27.

### 4.10 INORGANIC ARSENIC TRAINING

All personnel working with contaminated soil from SWMUs #03/10 and #10/15, where inorganic arsenic contamination is present, shall receive training on the OSHA Inorganic Arsenic Standard, 29 CFR 1910.1018 and 1926.1118.

### 4.11 SAFETY MEETINGS

Safety meetings for all MK employees and subcontractors personnel shall be conducted on a weekly basis. This is a group meeting intended to be a self assessment of safety performance and a chance to review any lessons learned as a group, plus an opportunity to introduce specialized training topics. The meeting shall be chaired by the MK General Superintendent and Subcontractor Supervisor(s) with assistance by the MK SSHO and/or Subcontractor designated competent safety person. This safety meeting can also be used to describe any changes in the Site Specific Training described in Section 4.4. Safety Meetings are documented using Figure 2 from this plan or equivalent. An additional Safety Meeting for all MK personnel and Subcontractor Job Supervisor(s) shall be conducted at least once per month. The monthly meeting is chaired by the MK Project Manager or General Superintendent with assistance from the MK SSHO. Its purpose is to review and rate safety performance and identify any areas requiring additional specialized training. The meeting can be held offsite during non working hours, preferably as a dinner or luncheon type meeting. This meeting shall be documented to include date, time, personnel in attendance, topics, and instructor. The Safety Meeting shall be documented using Figure 2 or equivalent.

# 4.12 PLAN OF THE DAY (POD) MEETINGS

Plan Of The Day (POD) Meetings shall be held at the beginning of each shift to review the planned work of the day as well as any safety and quality concerns. The meeting is chaired by the MK General Superintendent or MK PM. The attendee's include the Subcontractor(s) Job Supervisor, the MK Quality Control representative, the MK SSHO and other selected personnel. The date, time, personnel attending and meeting minutes shall be documented using Figure 2 or equivalent.

## 4.13 PRE- AND POST-ENTRY BRIEFINGS (MEETING)

Pre-entry briefings shall be held for employees prior to their initiating any new or differing site activity in an exclusion zone and at such other times as necessary to ensure employees are knowledgeable of the work plan activity, the Activity Hazards Analysis

(AHA), and that the plan and analyses are being followed. Pre Entry Briefs are the responsibility of the Subcontractor Job Supervisor. Attendance shall be documented using Figure 3 from this Plan. Feedback on the AHA worksheets is highly regarded and the MK SSHO should make every effort to validate there applicability.

Post-entry briefings shall be held as needed to assure changes in conditions or work methods are promptly reported and addressed. In addition, all incidents will be promptly evaluated and the evaluation results will be communicated to personnel in post-entry briefings and other meetings. Lessons-learned from these evaluations shall be communicated to all affected personnel. Post Entry Briefs are the responsibility of the Subcontractor Job Supervisor. They are not required to be formally documented, a logbook entry is sufficient.

### 4.14 QUALITY CONTROL PREPARATORY PHASE INSPECTION MEETING

The MK SSHO shall attend all Quality Control Preparatory Phase Inspection Meetings to discuss any safety and health concerns requiring special attention and to review anticipated safety requirements for a specific definable feature of work, and to review specific air monitoring required.

### 4.15 RECORDKEEPING

Written records of all required training and meetings shall be maintained on site by the MK SSHO. These records shall be made available to U.S. Navy personnel upon request. Subcontractors to MK shall provide copies of training certifications along with proof of medical surveillance physical and respirator certification to the MK Project Manager or MK SSHO prior to personnel working on site.

# 5.0 MEDICAL SURVEILLANCE PROGRAM REQUIREMENTS

### 5.1 SUMMARY

All project personnel who work within the exclusion zone for more than three days per month, or are required to use respiratory protection regardless of the time within the exclusion zone, will participate in a medical surveillance program in accordance with OSHA 1910.120 and 1926.65, Section 16 from the MK Safety and Health Program Description for Hazardous Waste Site Operations (MK employees only), and as described in this section. New construction or clean activities (no contamination likely to be encountered) will not require participation in the Medical Surveillance Program unless special tasks dictate as determined by the MK SSHO.

The medical surveillance program consists of a baseline or initial examination, an annual medical examination, a termination examination, and episodic medical examinations as necessary. Termination exams specify to this job have been determined to not be necessary unless specific criteria is met as discussed in the MK Safety and Health Program for Hazardous Waste Site Operations, Section 16. Note: if MK personnel require physicals or other medical surveillance in the field, the MK PM and MK SSHO shall establish a purchase order agreement with the selected medical facility and contact the Health and Safety Manager for a copy of a sample Client Profile for their use as the purchase order specification.

At a minimum, the content of the initial, annual and termination examinations shall consist of the following medical tests and procedures (or as determined by the examining physician):

- · Medical and occupation history.
- Complete physical examination.
- Pulmonary function test (FVC and FEV<sub>1</sub>).
- Complete blood count, generally SMAC-22 or 24 biochemical profile.
- Audiometry.
- Complete urinalysis.
- · Resting electrocardiogram.
- Vision screen.
- Chest X-ray (PA) (at the direction of the examining physician).

**Special Requirement #1**. Pre-employment or pre-task baselines will be obtained for heavy metals via 24-hour urine collection and analysis for each MK Employee and Subcontractor working in any of the SWMU exclusions zones on a routine basis. Metals analyses will include antimony, arsenic, cadmium, and chromium.

**Special Requirement #2**. Pre-employment or pre-task baselines will be obtained for heavy metals; specifically, cadmium and lead via whole blood collection and ZPP analysis for each MK Employee and Subcontractor working in any of the SWMU exclusions zones on a scheduled basis.

An episodic examination will be required if any employee develops signs or symptoms related to the possible overexposure to hazardous substances or other health hazards, if the employee has been injured, or if the employee has been exposed above the permissible exposure limits or published exposure levels in an emergency. The scope of any episodic examination will be left to the discretion of the examining physician.

A copy of the examining physician's written opinion about the employee's ability to perform work on this hazardous waste site and use respiratory protection, and a statement that the physician has informed the employee of the results of the examination shall be kept on site. Subcontractors must provide this information to the MK Project Manager or the MK SSHO prior to mobilization activities on site. For privacy reasons, these statements must not contain the specific results of medical examinations or tests.

### 5.2 DRUG ABUSE PREVENTION PROGRAM

Morrison Knudsen Corporation is committed to the establishment and maintenance of a safe and efficient work environment for all employees free from the effects of alcohol, illegal drugs, other controlled substances, and prohibited items.

### 5.3 RECORDKEEPING

MK will manage medical surveillance records for MK employee's only. The statements by the examining physician(s) attesting to the medical qualification of individual workers shall be maintained at the project site for both MK and the Subcontractor and will remain a part of the project files. The Subcontractor's are responsible for all medical records management for their direct hire employees in accordance with OSHA 1910.120 and 1926.65.

# 6.0 PERSONAL PROTECTIVE EQUIPMENT

In addition to engineering controls and administrative controls (e.g. work practices), Personal Protective Equipment (PPE) (a.k.a. Chemical Protective Clothing) shall be used to protect personnel from exposure to contaminants which may be encountered during activities on site as warranted. The following guidelines will be followed:

- Respirators and other PPE necessary to protect the health of employees shall be provided by their employer.
- Only NIOSH/MSHA-approved respirators and cartridges shall be used.
- The respirator user's medical status shall be verified by the MK SSHO before work is performed requiring respirator use.
- MK IH Procedure 14.0 shall serve as the written standard operating procedure
  governing the use of respirators at the job site. Section 10 from MK Safety and
  Health Program Description for Hazardous Waste Operations shall serve as the
  written standard operating procedure governing the use of PPE at the job site.
  Safe Work Practice (SWP) 4.0, found in Section 17 of the MK Safety and Health
  Program Description shall serve as guidance in chemical protective clothing
  selection and donning/doffing procedures.
- Respirators will be assigned to individual employees for their exclusive use and marked to indicate to whom it was assigned, for the duration of this project.

Table 5 presents the basic levels (Level B, C, Modified D, and D) of PPE.

**Table 6** lists the minimum PPE level required for each task or operation. If air sampling/monitoring indicates that modification to the levels of protection are warranted, the MK SSHO is empowered with the authority to authorize the modification based on the guidance provided in **Table 7**, Airborne Contaminant Response Criteria.

The PPE has been selected based on what is known or anticipated about the site specific hazards. If conditions change, PPE selection and use shall be reviewed by the MK SSHO and the General Superintendent and upgraded or downgraded per their assessment. The MK SSHO shall record the rationale for the modification as a log book entry. Personnel will be trained if necessary on the use and limitations of specific pieces of PPE prior to initiation of work by their designated Supervisors during the Pre-Entry Briefs with assistance when necessary from the MK SSHO or General Superintendent.

PPE will be maintained and stored in accordance with the manufacturer's recommendation and good industrial hygiene practices. Personnel will inspect PPE prior to each use to assure the PPE is clean and good working order. Training will be provided to personnel

concerning PPE inspection criteria by their supervisors with assistance when necessary from the MK SSHO. The MK SSHO shall conduct evaluations of effectiveness and useability of PPE. Logbook entries are sufficient but the data should be readily transferable to the safety and health project completion report (see Section 13.5).

# 7.0 MONITORING AND SAMPLING

Air monitoring refers to direct real time reading of airborne concentrations and air sampling refers to time integrated air sampling, either personal or area samples. The MK SSHO will maintain one photo ionizing detector (PID) with 10.2 or 10.6 eV lamp, a supply of colormetric indicator tubes and handpump, and one combustible gas indicator (CGI)/Oxygen (O<sub>2</sub>) meter as described in subsections 7.2.1 and 7.2.3. In addition, the MK SSHO will maintain a sound level meter and dust aerosol meter plus all time integrated air sampling equipment. Execution of real time air monitoring will be coordinated by the MK SSHO in accordance with the requirements for air monitoring depicted in Table 9. Time integrated air sampling will be completed by the MK SSHO.

### 7.1 GENERAL

This section describes the air sampling and air monitoring program performed to evaluate project worker exposure to potentially hazardous airborne materials and to evaluate off-site impacts. The air sampling/monitoring results will be used to:

- Assess worker exposure to potentially hazardous materials with respect to the Permissible Exposure Limit (PEL) for Air Contaminants (Title 29 Code of Federal Regulations, Part 1910.1000) or other published exposure levels.
- Assess the adequacy of engineering controls and respiratory protection.
- Delineate areas where controls or respiratory protection is needed.
- Establish work control zones.

### 7.2 MONITORING

# 7.2.1 Volatile Organic Compounds

A direct-reading, real-time photo-ionization or flame-ionization detection instrument capable of detecting volatile organic compounds (VOCs) will be used whenever excavation and penetration in potentially contaminated areas occurs. Readings will be taken at locations that reflect approximate concentrations of organic vapors and gases in the breathing zone of excavation personnel. Results of the organic vapor and gas monitoring will be documented. If necessary, the level of PPE used by personnel will be modified. Table 6 describes the level of PPE to be used, based on the concentration of organic vapors and gases in the breathing zone of project personnel. The direct-reading real-time organic vapor and gas monitoring equipment will be "response checked" according to the manufacturer's instructions before use each day, and calibrated yearly by the manufacturer or other qualified personnel. Records of the response check, maintenance, and annual calibration will be maintained on-site.

Colorimetric indicator tubes (e.g., Dräeger tubes) shall be used at the MK SSHO's discretion whenever the PID instrument measures breathing zone concentrations of organic gases or vapors exceeding 5 parts per million (ppm) PID equivalents greater than background concentrations for time period greater than five minutes or as deemed necessary by the MK SSHO. Colorimetric Tubes are used to further characterize the potential exposure. Generally, the frequency of sampling with indicator tubes is driven on the monitoring results of the PID/FID. The following compounds may be measured by colormetric indicator tubes: benzene, toluene, xylene, ethylbenzene, petroleum hydrocarbons (n-Octane), trichloroethene (TCE) and tetrachloroethene (PCE), hydrogen sulfide, carbon dioxide, ammonia, oxides of nitrogen, and formaldehyde. If benzene or other volatiles are detected, the level of PPE will be upgraded as specified in Table 7, or as determined by the MK SSHO.

#### 7.2.2 Airborne Dust

A direct-reading, real-time instrument capable of detecting airborne dust (such as MIE Miniram) may be used, based on visible observations of excessive dust. Readings will be taken at locations that reflect approximate concentrations of airborne dust in the breathing zone of project personnel. Results of the airborne dust monitoring will be documented. If necessary, the level of PPE used by personnel will be modified or engineering controls enhanced. The direct-reading, real-time monitoring equipment will be "response checked" according to the manufacturer's instructions before use each day, and calibrated by the manufacturer or other qualified personnel yearly. Records of the response check, maintenance, and annual calibration will be maintained on-site. When such monitoring is conducted and the results are greater than 10 mg/m³ total dust concentrations, immediate steps will be taken to determine the cause modify site operations.

# 7.2.3 Confined Space Monitoring

Entry into open excavations greater than 5 foot depth shall be considered permit-required confined spaces until monitoring for toxic and physical hazards has determined that the space can be entered without a permit. The logic of classification of confined spaces shall follow the requirements established in 29 CFR 1910.146 Appendix A. Monitoring and hazard evaluation shall be completed by the MK SSHO on either a MK "Non-Permit Required Confined Space Work Form" (Attachment IV, Procedure 9 of IH Procedures Manual) or on a "Confined Space Entry Form" (Attachment VI, Procedure 9 of IH Procedures Manual).

Monitoring must be conducted for (1) oxygen content to demonstrate that available oxygen is greater than 19.5 % and less than 23.5 %, (2) flammable/explosive atmospheres must be less than 10 % of the lower flammable limit (LFL) of potential explosive/flammable gases or dusts that may be present, and (3) toxic gases must be less than either the OSHA PEL or the ACGIH TLV whichever is less or required by law. Only personnel suitably trained to conduct hazard evaluations of confined spaces will be authorized to conduct monitoring and testing of atmospheres.

## 7.2.4 Perimeter Monitoring

Perimeter monitoring to evaluate emissions of VOCs will be performed periodically during soil excavation. At a minimum, perimeter monitoring will be performed initially at 2-hour intervals using a direct-reading real-time organic vapor instrument. When such monitoring is conducted and results are 5 ppm higher than background levels of organic vapors, immediate steps will be taken to determine the cause, change site operations, evacuate unprotected personnel and the public if necessary, and notify agency contact personnel.

Perimeter monitoring to evaluate emissions of airborne dust will be performed periodically during soil excavation, as warranted. When such monitoring is conducted and results are greater than 1.0 mg/m³, immediate steps will be taken to determine the cause, modify site operations, evacuate unprotected personnel and the public if necessary, and notify agency contact personnel.

## 7.2.5 Noise Monitoring

Noise monitoring will be performed, as warranted, at the initiation of each task or operation to determine the sound levels associated with the particular task or operation. Sound levels will be determined at locations that best approximate the sound levels at the ear of potentially affected personnel. Noise monitoring equipment will be "response checked" according to the manufacturer's instructions prior to use each day, and calibrated by the manufacturer or other qualified personnel yearly. Records of the response check, maintenance, and annual calibration will be maintained on-site.

## 7.2.6 Heat Stress and Cold Stress Monitoring

When temperatures at the site are above 65°F, the wet bulb globe temperature (WBGT) may be used to monitor the potential for heat stress. Work/rest periods will be adjusted according to the guidelines stated in the current edition of *ACGIH Threshold Limit Values for Chemical Substances and Physical Agents*. When the clothing worn differs from the ACGIH standard ensemble such as in the case of workers wearing semipermeable or impermeable clothing, guidelines established in the NIOSH/OSHA/USCG/EPA, Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, Section 8 should be consulted. The following is a summary from that document.

When employees are required to wear impermeable chemical protective clothing in temperatures exceeding 70°F, employees shall use the "buddy system" to monitor each other's pulse rate at the start of each rest period. If the pulse rate exceeds 110 beats per minute, the next work period shall be shortened by one-third without shortening the rest period. The pulse rate shall be monitored again at the beginning of the next rest period and if the pulse rate exceeds 110 beats per minute, the work period shall again be shortened by one-third. No employee shall be permitted to continue working in PPE if his or her pulse rate exceeds 110 beats per minute continuously. Table 9 can be used to establish work/rest periods and the frequency of monitoring pulse rates.

Guidelines for the prevention of cold stress and cold stress TLVs shall follow the guidelines stated in EM-381-1-1 Section 06.J and the current edition of *ACGIH Threshold Limit Values* for Chemical Substances and Physical Agents. At air temperatures below 50°F, the air temperature and wind speed shall be monitored by the MK SSHO qualitative assessment of cold stress risk shall be made by comparing wind speed and actual temperature to the assigned equivalent chill temperature depicted on Table 2 in the Cold Stress section of the ACGIH booklet. Unless there are unusual or extenuating circumstances, cold injury to other than the hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. These symptoms are described in Section 2.5.3. The use of extra insulating clothing and/or reduction of the exposure period are among the special precautions which should be considered.

Cold weather clothing requirements shall follow the guidance listed in Section 06.J.09 of EM-385-1-1. If work is performed continuously in the cold at an equivalent chill temperature or below 20 °F, heated warming shelters shall be made available nearby the work area and the workers encouraged to use these shelters at regular intervals. A cold weather work/warm-up regimen shall be established when outside ambient temperature is less than a -15 °F in accordance with Table 3 of the ACGIH booklet in the Cold Stress section.

# 7.2.7 Carbon Dioxide, Hydrogen Sulfide, and Other Chemical Monitoring

At the Bioremediation Facilities during active composting, real-time monitoring using colorimetric indicator tubes for carbon dioxide and hydrogen sulfide will be performed periodically by the MK SSHO in the buildings housing the windrows. If carbon dioxide levels exceed 4,000 ppm inside of the structure, the structure will be evacuated and action taken to vent the structure and maintain a level below 3,000 ppm. The ceiling for hydrogen sulfide is 10 ppm. Evacuation from the structure shall occur at 5 ppm, and action shall be taken to vent the structure and maintain a level below 5 ppm.

Also during active composting, real-time monitoring will be conducted periodically to determine if any detectable levels of methane, oxides of nitrogen, ammonia, and formaldehyde are present. Monitoring will be completed using colorimetric indicator tubes, except for methane where the LEL Meter will be used. If detectable levels are encountered, then full-shift time integrated samples will be obtained to better quantify the occupational exposure level and current controls (engineering, administrative and PPE) will be assessed to determine there adequacy.

## 7.2.8 Ionizing Radiation Monitoring

Deleted requirement.

## 7.3 AIR SAMPLING

# 7.3.1 Organic Compounds

Time-integrated air sampling for hydrocarbons using personal air sampling pumps will be performed by the MK SSHO during the composting process to determine what, if any, of the hydrocarbon constituents may be present and there levels. Sample collection and analysis will be completed in accordance with the following methods: (1) NIOSH 1500 for hydrocarbons, (2) NIOSH 1501 for aromatic hydrocarbons, and (3) NIOSH 1003 for halogenated hydrocarbons.

### Material and Method

- a. NIOSH 1500 collect on solid sorbent tube, coconut shell charcoal, 100 mg/50 mg; volume of 4 L, flowrate of ≤ 0.20 LPM based on n-hexane. Analyze by GC/FID, if hit, analyze with MS and provide readout against computer library.
- b. NIOSH 1501 collect on solid sorbent tube, coconut shell charcoal, 100 mg/50 mg; volume of 30 L, flowrate of ≤ 0.20 LPM based on benzene. Analyze GC/MS and provide a readout against computer library.
- c. NIOSH 1003 collect on solid sorbent tube, coconut shell charcoal, 100 mg/50 mg; volume of 60-70 L, flowrate approximately 0.136 LPM. Analyze by GC/FID, if hit, analyze with MS and provide readout against computer library.

## Sampling Strategy

During composting process: (1) obtain two "area" samples of full shift duration at random locations **inside** of the structure and **outside** of the structure (background) for each of the three methods approximately one week into the composting process; (2) obtain two "personal" samples from the windrow turning machine operator for each of the three methods approximately one week into the composting process during turning of the windrow; and (3) obtain two "personal" samples for each of the three methods approximately one week into the composting process from the person responsible for monitoring process parameters in each of the windrow piles before and after turning of the windrow. The first run of samples will qualify whether an exposure threat exists. Since the time personnel will be expected to be in the structures will be less than 8 hours, the sampling time will be adjusted accordingly. For each Method, estimate 12 samples for analysis (8 samples plus 4 blanks) for a total of 36 samples.

### **7.3.2 Metals**

Time-integrated air sampling for metals using personal air sampling pumps will be performed by the MK SSHO during soil excavation and screening, and during composting when the windrows are mixed from SWMU's 03/10 (Ammunition Burning Ground) and 12/13 (Mine Fill A) soil to determine what, if any, of the metal analytes may be airborne and there levels. SWMU 10/15 (Rockeye) soils will also be subjected to this analysis as a preliminary check since these soils are contaminated with metals, however, there soil concentration levels are much lower than SWMU's 03/10 and 12/13. Sample collection and analysis will be completed in accordance with (1) OSHA Method ID-125 or NIOSH Method 7300 for metals scan.

## Material and Method

a. OSHA ID-125 - collect on 0.8 μm cellulose ester membrane (MCE) filter with support pad with 3-piece 37 mm clear styrene acrylonitrile (SAN) cassette. Sample Volume = 720 L at 1.5 LPM. Analytes include aluminum, cadmium, iron, nickel, antimony, chromium, lead, arsenic, cobalt, zinc, beryllium, copper, and magnesium.

# Sampling Strategy

During soil excavation and screening: (1) obtain two "personal" samples of full shift duration from maximally exposed individuals completing soil excavation and screening tasks; and during composting (2) obtain two "personal" samples from the windrow turning machine operator during first week into the composting process during turning of the windrow; and (3) obtain two "personal" samples from the person responsible for monitoring process parameters in each of the windrow piles before and after turning of the windrow. Estimate 12 samples for analysis (6 samples plus 6 blanks).

## 7.3.3 Explosives Residues

Time-integrated air sampling for explosive residues as airborne aerosols using personal air sampling pumps will be performed by the MK SSHO during soil excavation and screening, and during composting when the windrows are mixed and composting process parameters are monitored. Sample collection and analysis will be completed in accordance with the following method: (1) OSHA Method 44.

### Material and Method

a. OSHA 44 - collect on sorbent and filter tube, 70/140 Tenax and glass fiber filter, OSHA Versatile Sampler (OVS) Tube. Volume = 60 L, rate = 1.0 LPM, time = 1 hour. Analysis by HPLC or equivalent providing a scan for specific analytes and isomers. Specific analytes include TNT, DNT, RDX and HMX.

Notes: DNT- Dinitrotoluene; HMX - Cyclotetramethylenetetranitramine or 1,3,5,7-Hexahydro-1,3,5,7-Tetranitrotriazine; RDX - Cyclonite 1,3,5-Hexahydro-1,3,5-Trinitrohydrazine; TNT- Trinitrotoluene or 2,4,6 Trinitrotoluene.

The following table summarizes the major transformation products (metabolites) of TNT and the source of the transformation. Further discussion with the analytical laboratory will determine specifically the analytes which can be detected using HPLC.

Degradation By-Product of TNT	Source
4 ADNT 4-Amino-2,6-Dinitrotoluene	Microbial transformation
2 ADNT 2-Amino-4,6-Dinitrotoluene	Microbial transformation
2,4 DNT 2,4-Dinitrotoluene	Impurity in production grade TNT
2,6 DNT 2,6-Dinitrotoluene	Impurity in production grade TNT
1,3,5 TNB 1,3,5-Trinitrobenzene	Impurity and photodegradation product
DNB 1,3-Dinitrobenzene	Impurity

The major environmental transformation products of RDX have been less well characterized but they include the mononitrosodinitro-, dinitrosomonitro-, and trinitrosotriazines as well as several hydrazines, formaldehyde and methanol. The environmental transformation products of HMX resulting from both aerobic and anaerobic transformations were the mono- through tetra-nitroso derivatives of HMX which eventually were metabolized to 1,1-dimethylhydrazine.

### Sampling Strategy

During soil excavation and screening: (1) obtain two "personal" samples of full shift duration from maximally exposed individuals completing soil excavation and screening tasks; and during composting (2) obtain two "area" samples preferably of full shift duration at random locations **inside** of the structure approximately one week into the composting process; and (3) obtain two "personal" samples from the person responsible for monitoring process parameters in each of the windrow piles before, during, and after turning of the windrow. Estimate 12 samples for analysis (6 samples plus 6 blanks).

## 7.3.4 Biological Hazards

Time-integrated air samples for bioaerosols will be obtained by the MK SSHO inside of the Composting Building during composting after the windrows are mixed and compared to background samples taken at a location outside of the perimeter of the Bioremediation site.

### Material and Method

a. Collect airborne aerosols by impaction on pre-selected growth media plates using a high volume sampling pump with 2-stage Andersen Impactor calibrated using 4-L glass calibration jar with calibration specific culture plates. The sampling flowrate is 28.3 LPM and sampling time will be set at 10-20 minutes depending on conditions. Samples will be obtained for the respirable and nonrespirable fractions (2-stage). The growth media will most likely be trypticase soy agar for bacteria and malt extract agar for fungi.

A separate growth media will be used for each of the following constituents and analyzed accordingly:

- 1. Total bacteria (total plate count), subculture from bacteria plate for E.Coli as a marker from manure.
- Fungi (molds and yeast)
- b. Collect samples from source inventory for analysis. May consist of water sample from collection sump in building for preliminary microbiological growth and/or contact sample from assumed fungal growth on building component. Samples to be obtained using contact slides and dip slides such as Biotest Diagnostics Corporation Hycon Contact Slides and Hycon Dip Slides.

## Sampling Strategy

During composting: (1) obtain two "area" samples inside of the composting structure and two "area" samples outside of the structure for each of the constituents approximately one week into the composting process immediately after turning of the windrows. Estimate 8 culture plates inside and 8 culture plates outside (16 total plates). Estimate 8 subculture plates from the total bacteria plates for E.Coli analysis. Estimate 4 field culture blanks and 2 control culture blanks. Sampling equipment will be sanitized between uses by dipping in or wiping with 70% ethanol and air drying.

During composting: (1) obtain two dip slides from water accumulated in building sump; and (2) obtain two contact slides from any assumed fungal growth on building components such as the floors or structural support members. Estimate 4 samples for analysis.

## 7.3.5 Wipe Sampling for Explosives Residues and Metals

Wipe samples will be obtained by the MK SSHO to assess the effectiveness of PPE controls and decontamination. Samples will be analyzed for metals and explosive residues.

### Material and Method

a. Collect wipe samples using glass fiber filter for explosives residues and paper filters wetted with distilled water for metals. Obtain random surface samples from the inside of used protective coveralls, and from the personnel decontamination shower trailer, specifically the change room area and the lunch/conference room. Samples are obtained by wiping through a 100 cm² template moving in concentric squares from the outside to the inside of the sampling area. After wipe sampling, the media is folded with the exposed side in, placed in a sampling vial, and sent to the laboratory for analysis. Clean latex gloves are required for each sample. Metal samples are analyzed at the laboratory by ICP and explosive residues by HPLC.

## Sampling Strategy

Samples are obtained randomly and unannounced during the first year of operations at the discretion of the MK SSHO. Estimate 10 samples for metals and 10 for explosive residues.

### 7.4 AIR MONITORING AND SAMPLING REQUIREMENTS

Air monitoring and sampling requirements are shown in Table 9.

### 7.5 RECORDKEEPING AND CHAIN OF CUSTODY

Written records of all monitoring will be maintained on site and affected employees will be notified of monitoring results representative of their exposure. For industrial hygiene sampling requiring collection and shipment of a sample to an approved analytical laboratory, Chain-of-Custody forms will be properly completed and accompany all collected samples in accordance with MK Industrial Hygiene Procedures Manual, Procedure 7.0, titled Analytical Laboratory Procedures. The selected AIHA accredited industrial hygiene lab will be to be determined. Turn-around time will be set at 10 working days. Workers will be notified of time integrated sampling results via memo to the designated supervisor.

# 8.0 GENERAL SAFETY RULES AND PROCEDURES

## 8.1 GENERAL

Operations shall be conducted in a safe manner consistent with the policies and procedures outlined in this SSHP. The number of personnel shall be restricted to the minimum necessary to complete the required work as an administrative control to limit personnel exposures to potential site chemical, physical and biological hazards.

All project and subcontractor personnel assigned to this project are responsible for following this SSHP unless modified in the subcontracting special conditions document, for using safe practices, and for wearing the PPE specified by the MK SSHO. Project personnel shall report hazards and unsafe conditions and practices to the MK SSHO. All federal, state and local occupational health and safety regulations must be complied with by project personnel. Violations of project procedures may include disciplinary measures up to and including termination.

### 8.2 RULES AND PROCEDURES

- The Subcontractor shall have available two 20-lb rated ABC multipurpose dry chemical fire extinguishers; first aid kit including CPR kit (Pocket Mask) and biohazards control kit; emergency eyewash; and spill response equipment (where necessary) available at every controlled work location. Also, the Subcontractor shall complete the Work Zone Map and post it at each work site including emergency phone numbers. Work zone signs shall be posted in accordance with the requirements of Section 9.1.4 of this SSHP. Work zone signs are the responsibility of MK for the Bioremediation Facility.
- Avoid driving over dry grass that is higher than the ground clearance of the vehicle. Catalytic converters on the undercarriage of vehicles are sufficiently hot to ignite dry prairie grass. <u>Never</u> allow a vehicle with a warm undercarriage to sit in a stationary location over dry grass or other combustible materials.
- Do not eat, drink, smoke, take medications, chew gum or tobacco, or put objects in mouth while in the exclusion zone and contamination reduction zone or when handling samples.
- After handling samples, thoroughly wash hands and, if necessary, face, before eating or putting anything in mouth (i.e., avoid hand-to-mouth contamination).
- At a minimum, wear hard hats, safety glasses and steel-toed boots when inside the work boundaries.

- Remain a safe distance from the excavation equipment when not involved in operation or monitoring activities.
- Do not <u>under any circumstances</u> enter or ride in or on any backhoe/excavator bucket, materials hoist or any other device not specifically designed for carrying human passengers.
- Remain aware of your own and other's positions with regard to rotating equipment and be extremely careful when assembling, lifting and carrying items that may cause pinch point injuries and collisions.
- Be alert to the symptoms of fatigue, heat stress and cold stress and their effect on the normal caution and judgment of personnel.
- Use explosion proof sampling equipment and tools.
- Use ground fault circuit interrupters (GFCI) with all electrical tools and equipment.
- Stand clear of trenches during excavation. Always approach the excavation from upwind.
- Stand upwind, whenever possible, of excavations and other sites where the soil has been disturbed.
- Be alert to potentially changing exposure conditions as evidenced by perceptible odors, unusual appearance of excavated soils, oily sheen on water, or other evidence of possible contamination.
- Do not enter any excavation or trench greater than five feet in depth unless authorized by the MK SSHO.
- Keep hand tools off the ground and centrally located on a plastic cover or area
  of no contamination whenever possible to avoid tripping hazards and the spread
  of contamination.
- Use the buddy system at all times while working at the site in controlled work zones. No one is to work alone in the Exclusion Zone or Contamination Reduction Zone without permission from the MK SSHO and MK General Superintendent.
- Minimize truck tire disturbance of all stabilized sites and areas beyond the work area boundaries.

- Cease all work operations on the site at sunset unless the control zone is adequately illuminated with artificial lighting.
- Subcontractor Job Supervisors shall attend the POD meeting prior to the start
  of the work and conduct pre and post entry briefs with all affected workers. All
  personnel shall sign and record the time in and out of all Exclusion Zones.
- Avoid direct contact with contaminated materials unless necessary for sample collection or required observation. PPE shall be worn at all times, as required.
- Remove disposable clothing and follow decontamination procedures.
- Always use an appropriate level of personal protection as assigned in this SSHP. Lesser levels of protection can result in otherwise preventable exposure.
- Maintain a high level of awareness of the limitations in mobility, dexterity and visual impairment inherent in the use of Level B and Level C PPE.
- Establish prearranged hand signals or other means of emergency communication when wearing respiratory equipment, since this equipment impairs speech communication.
- Wear hearing protection if you have to shout to communicate at a distance of three feet in steady-state (continuous) noise or when you expect loud impact noise from certain activities. The MK SSHO will assess potential noise exposure and provide recommendations on correct hearing protection devices.

## 9.0 WORK ZONES

Where a potential for worker exposure to potentially hazardous substances and physical hazards, work zones will be established and the flow of personnel and equipment will be controlled. The establishment of work zones will ensure that personnel are properly protected against hazards present in the work area, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency.

Prior to the commencement of remediation field activities and clean construction, Work Zones shall be established by MK. These work zones will be depicted on Work Zone Maps that are field prepared by the MK Superintendent. In addition to the zones, these maps should show assembly points; evacuation routes; location of first aid equipment, fire extinguisher and eye wash and spill containment equipment; and emergency communications equipment. One copy of the work zone maps and all revisions shall be retained by the MK SSHO in Appendix B of the field master copy SSHP. Posted with the Work Zone Map shall be the list of emergency phone numbers and route map to hospital. MK shall maintain a sign-in and sign-out log at the entrance to the Contamination Reduction Zone (CRZ) for personnel entering the Exclusion Zone (EZ).

# 9.1 EXCLUSION ZONE (EZ)

The EZ is the area where hazardous substances are present or expected to occur, or health and safety hazards are present. Entry into this area is limited to personnel required to perform the work who are wearing the specified PPE and have attended a Pre-Entry Briefing. Everyone entering the EZ shall have completed the required health and safety training and will participate in the medical surveillance program as necessary. The boundary of the EZ will be determined for each activity and may change depending on activities and conditions.

An EZ will be established to encompass the contaminated area. For this project, the EZ for each soil excavation area will consist of the immediate area of excavation extending outward for approximately 20 feet. The EZ will include the excavated soil classified as potentially contaminated that may be stockpiled.

The EZ will be clearly delineated with signs, barricade tape, fences, or other suitable means. Access control points will be established to regulate the flow of personnel and equipment in an out of the zone and to help verify that proper procedures for entry and exit are followed. PPE levels in the EZ are initially scoped as Level C, depending on the task listed in Table 6. Decontamination will follow guidelines established in Section 10. Gross contamination will be removed in the EZ followed by additional decontamination in the CRZ. The MK SSHO will monitor activities in the EZ from his position in the CRZ. The boundary line from the EZ to the CRZ will be based on the following criteria:

- 1. Approximately 20 feet outward from contaminated work area, or as much as necessary, to include the heavy equipment operating in the zone and the temporary staging of any potentially contaminated soil.
- Perimeter air monitoring for VOCs reads no increase in ppm-equivalents above background and the portable dust/aerosol monitor shows no increase in concentration above background. Background is considered the Support Zone (SZ) area.

# 9.2 CONTAMINATION REDUCTION ZONE (CRZ)

The CRZ is the transition area between the contaminated area, the EZ and the clean area, the SZ. While designed primarily to reduce the possibility of the support zone becoming contaminated or affected by EZ activities, the CRZ is also used for decontamination of personnel and equipment. No personnel or equipment will be allowed to exit the contamination reduction and exclusion zones without being properly decontaminated except in emergency situations. The immediate area around the EZ extending outward as much as necessary to accommodate the complete length of the longest piece of heavy equipment will be designated the CRZ. Used PPE will be removed and stored in properly marked plastic lined 55-gallon drums or other containers for later disposal. A sign-in and sign-out log sheet shall be maintained by MK at the CRZ and all personnel entering the EZ must sign in and out. Copies of the completed log sheet shall be distributed to the MK SSHO by the Subcontractor Job Supervisor or Subcontractor SSHO on a weekly basis.

## 9.3 SUPPORT ZONE (SZ)

The SZ consists of all areas outside the exclusion and contamination reduction zones. These areas are used for all site activities which are not limited to the EZ or CRZ equipment and material storage, offices, parking, etc. The SZ will also serve as the staging area for all activities to be conducted.

### 9.4 CONSTRUCTION ZONE

The Bioremediation Facility construction zone consists of all areas within the immediate construction area of the Bioremediation Facility. This area represents all new clean construction work prior to start-up operations.

#### 9.5 WORK ZONE CONTROLS

Before site operations begin, the SZ MK site office and Subcontractor offices shall be identified with signs identifying as such.

MK shall post signs at entrances to the CRZ and EZ stating the following:

HAZARDOUS AREA KEEP OUT

# DANGER **AUTHORIZED PERSONNEL ONLY** PERSONAL PROTECTIVE EQUIPMENT IS REQUIRED IN THIS AREA

MK shall post signs at the entrance to the CRZ before operations begin, stating:

NO SMOKING, DRINKING OR EATING BEYOND THIS POINT

Entrances to the Bioremediation Facility Construction Zone will be conspicuously posted with signs by the Construction Subcontractor stating the following:

> **CONSTRUCTION AREA KEEP OUT** DANGER **AUTHORIZED PERSONNEL ONLY**

# 10.0 PERSONNEL AND EQUIPMENT DECONTAMINATION AND HYGIENE PROCEDURES

All personnel, clothing and equipment leaving an exclusion zone (contaminated or potentially contaminated area) shall be inspected and, if necessary, decontaminated to remove any potentially harmful substances that may have adhered to them. Some equipment/clothing may be disposed of rather than decontaminated. In this case, the used PPE and/or equipment (e.g. disposable sampling equipment) will be stored in properly marked, plastic lined 55-gallon drums in the CRZ. A Decontamination Facility will be constructed for personnel decontamination and for equipment decontamination. This section gives guidelines regarding the decontamination procedures to be implemented. Final details will be described during the site-specific safety and health briefing prior to commencing field operations.

### 10.1 EMERGENCY PERSONNEL DECONTAMINATION

Based on the type of emergency that is postulated, the following types of response actions are anticipated for personnel emergencies within the exclusion zone.

A. Critical Triage Condition (life threatening) - Emergency evacuation or extrication from the exclusion zone to contamination reduction zone where emergency medical treatment and stabilization will be attempted until arrival of first responding medical unit. Or, emergency medical treatment and stabilization will be completed in the exclusion zone till arrival of first responding medical unit. In either case, gross decontamination will be completed to the extent possible by removal PPE, wiping patient down to remove contamination and/or wrapping patient to prevent spread of contamination.

B. Marginal Triage Condition (non life threatening) - patient will be evacuated from exclusion zone and treated in the contamination reduction zone followed by decontamination and patient preparation for transport to emergency medical facility. Decontamination could occur first followed by medical treatment in selected scenarios.

### 10.2 PERSONNEL DECONTAMINATION

Decontamination (decon) stations will be established in the contamination reduction zone. The decon stations will consist of the following, as appropriate:

- Equipment drop to include used respirator receptacle.
- Portable High-Energy Particulate Air (HEPA) vacuum for vacuuming PPE before removal. Note: this requirement may be deleted pending results of airborne monitoring and engineering dust controls.

- Boot wash station and glove wash station with boot pick for cleaning initial mud cakes from boots (a tub of water and detergent (Alconox®) with brushes for cleaning and another tub of water for rinsing.
- Sampling equipment wash station (similar to boot wash station).
- Disposable clothing drop. All contaminated or potentially contaminated disposable clothing shall be placed into labeled 6-mil plastic bags within a 55-gallon drum for disposal.
- Personal showers and washing facilities consisting of water, towels and soap.
   Street clothing shall be stored in lockers provided at the shower facility. Note: this facility will be located at the Bioremediation Facility.

### 10.3 EQUIPMENT DECONTAMINATION

All equipment/tools used in the exclusion zone will be inspected for contamination prior to removal from the site. Any equipment/tools with visible contamination will be cleaned prior to removal from the site. A water and detergent solution will be used for highly contaminated equipment, followed by a high-pressure water rinse if necessary. All water used during decontamination will be contained for disposal. Construction and field equipment will be decontaminated at each temporary decontamination facility. If contamination can not be removed on-site, the affected surfaces of the equipment will be wrapped in plastic and transported to the Bioremediation Facility where more thorough decontamination can be performed prior to release.

### 10.4 WASHING FACILITIES

A hand and face washing facility shall be made available in each CRZ consisting of water, towels and soap for personnel, or the washing facility at the Bioremediation Facility can be used if logistics are acceptable.

### 10.5 DECONTAMINATION WASH WATER

Equipment and personnel decontamination areas will be designed to allow for collection of all wash/rinse waters into 55-gallon drums or a larger temporary storage container.

## 10.6 SANITATION AND PERSONAL HYGIENE

Personnel exiting the CRZ are required to thoroughly wash their hands and face prior to eating, drinking, smoking, or using toilet facilities. Adequate toilet, hand washing and lunchroom facilities free of contaminants shall be made available by the MK.

# 11.0 ON-SITE FIRST AID AND EQUIPMENT

#### 11.1 FIRST-AID AND MEDICAL FACILITIES REQUIREMENTS

At a minimum, 16-unit first aid kits shall be maintained by MK in their office trailer and each of the Subcontractors shall maintain a first aid kit at their office trailer and have sufficient supply of kits for each of the work sites. The location of the first aid kit shall be communicated to project personnel as part of the site-specific and pre-entry brief training. Included with the first aid kit shall be a CPR Pocket Mask and a biohazards control kit (universal precautions and clean up kit). The MK SSHO can require upgrades to the first aid equipment requirements as deemed necessary for this job (e.g. insect repellants and sunscreen)

An emergency eyewash, fire extinguisher and spill control kit (if applicable) at each controlled work area. The Bioremediation Facilities will have stationary eyewash/drench equipment. The Subcontractor is responsible for furnishing their office trailers and each controlled work location with this equipment as stated in Section 8.2 of this SSHP. The emergency phone number list and route map to medical facilities shall be posted at each office trailer and at each controlled work zone as part of the MK prepared Work Zone Map.

### 11.2 REPORT OF FIRST AID CASES

All first aid cases, accidents and incidents shall be promptly reported to the MK SSHO. The MK SSHO shall immediately notify the Navy Technical Representative (NTR) or the Navy Resident Engineer in Charge of Construction (REICC) of all injuries even if preliminary information is available. The MK SSHO and MK PM shall follow the guidance presented in Program Procedure PHSP-04.1. The MK Charleston Project Management Office (PMO) should be notified shortly after notification to the Navy's designated authority. If an on-site official cannot be reached, the MK Charleston PMO still should be promptly notified at (803) 554-0100.

A written report of the injury must be provided to the ROICC or REICC and MK Charleston PMO within 24 hours of the incident via memo form. This report is to include as attachments:

- a. Employer's First Report of Injury (Workman's Comp Insurance Form)
- b. Supervisor's Accident Investigation Report (MK Form CAS 24/77)
- c. Accident Data Report (MK Form 6783/91)
- d. Any records provided by the Medical Service Provider such as 1) Hospital Emergency room Report, 2) Examining Physician's designation of work restriction, and 3) Examining Physician's Work Release.

# 12.0 EMERGENCY RESPONSE PLAN AND CONTINGENCY PROCEDURES

This section describes a contingency plan to be implemented in the event of injuries, illnesses, accidents, and fires. The contingency plan provides guidelines for the proper response to emergency situations, however the actual response will depend on the situation.

In the event of an emergency, the MK SSHO, MK General Superintendent and/or Subcontractor Job Supervisors will direct all personnel to take appropriate action which could include any or all of the following:

- Evacuate all personnel involved to a safe place of refuge.
- Notify emergency services using phone numbers identified in Table 3.
- Initiate emergency response action.

### 12.1 PRE-EMERGENCY PLANNING

During mobilization activities for this project, the MK Project Manager, MK General Superintendent and the MK SSHO shall review the Program Procedure PHSP 02.1 and execute the steps necessary to assure effective emergency response requirements and resources are established for this project.

In addition to the guidance provided in this document and the preconstruction meeting, all safety meetings and pre-entry briefs shall include emergency response preplanning specific to each task and work site as a topic area. This training will include:

- Assembly Points. If the work activity may result in a release of hazardous substances, more than one assembly point will be specified to ensure that at least one upwind assembly point is accessible. This also pertains to fires and sites subjected to adverse weather conditions. Information must be included on the Work Zone Maps to be completed by the MK Subcontractors.
- Emergency Response Coordinator. The MK SSHO, as the onsite emergency response coordinator, will contact the emergency response providers, account for individuals at the assembly point, and plan the appropriate response.
- Evacuation Routes. Routes will be specified as needed. Information must be included on the Work Zone Maps.
- Means of Evacuation. The number of personnel that may be evacuated from the work site by various routes will be evaluated by the MK SSHO.
- Means of Communication. This will include the means of alerting personnel to an emergency at all points in the work site and should consider the sound screening

potential of hearing protection, distance and noisy equipment when specifying the use of alarms, horns and sirens. The means of communication with emergency response providers will be considered. Information must be included on the Work Zone Maps.

- Designation of a location for first aid services, fire extinguisher(s) and spill control
  equipment. Information must be included on the Work Zone Maps.
- Procedures to be followed by employees who remain to manage critical operations to insure safe shutdown.

### 12.2 RESPONSIBILITIES

The following is a description of personnel roles, lines of authority, and the emergency response communication/notification responsibilities for site personnel.

# 12.2.1 Project Personnel

It is the responsibility of all project personnel to recognize conditions that have the potential for resulting in a personal injury or damage to property, and to report the condition immediately to their supervisor or the MK SSHO.

# 12.2.2 Project Manager

The Project Manager is responsible for assuring adherence to the administrative elements and implementation of the Emergency Response Plan (this section of the SSHP). He will evaluate the site's preparedness for emergency responses and identify special conditions which may require additional preparations. He will ensure that necessary equipment and facilities are provided to support this plan.

# 12.2.3 MK Certified Industrial Hygienist (CIH)

The CIH is responsible for preparing the Emergency Response Plan (this section of the SSHP). The CIH will develop and review the Emergency Response Plan, evacuation plans, and oversee implementation at the site. The CIH will ensure that supervisors and employees meet the training requirements of the plan and approve the equipment used in the plan. The CIH may designate duties on site to the MK SSHO. The CIH is the designated Health and Safety Manager based in Boise, ID.

# 12.2.4 MK Site Safety and Health Officer (SSHO)

The MK SSHO is responsible for directing response actions to emergency situations. He will coordinate with project management to ensure the availability of response equipment and supplies, and initiate drills. Emergency response plans will be evaluated over the

course of the project by the MK SSHO to keep them up-to-date and to ensure that they are applicable and relevant to emergency response organizations.

#### 12.2.5 Subcontractors

All MK and Subcontractor personnel will comply with the provisions of this plan and participate in training as required to implement response procedures. All personnel will be cognizant of their work areas and notify their supervisors and the MK SSHO of hazards at the site.

#### 12.3 EMERGENCY RECOGNITION AND PREVENTION

Site personnel shall be apprised of hazards and life-threatening emergency situations during site-specific training to include the project kickoff site specific training, safety meetings and briefs. Means to control hazards and mitigate emergency situations will be addressed at that time.

### 12.4 SAFETY ZONES

Suitable assembly points will be established at the start of the project for each work site. These assembly points will provide a safe point of refuge for site personnel. Additional information will be provided in the site briefing concerning other hazards that may arise at the site. Safety Zones or assembly points must be included on the Work Zone Map.

## 12.5 SITE SECURITY AND CONTROL

At all times, site personnel working in an area in the near vicinity of an emergency situation shall be apprised of the emergency as soon as possible. Only authorized personnel shall be allowed into the emergency area. As necessary, the emergency area may be cordoned off and access restricted by MK and the Subcontractors.

### 12.6 EVACUATION ROUTES

Evacuation routes will be established based on scope of work, location of work and atmospheric conditions. Evacuation routes shall be posted in various locations on the site if necessary and included on the Work Zone Map. All site personnel will be made aware of evacuation procedures during site-specific training especially pre entry briefings. Topography, layout and prevailing wind conditions shall be considered in establishing evacuations routes and assembly points.

### 12.7 EMERGENCY DECONTAMINATION

In the event an employee is injured or becomes ill and requires hospital treatment, the extent of decontamination to be performed will be assessed based on severity of the injury or illness and time delay that decontamination may cause. If the employee has any signs

of contamination, the ambulance and hospital staff will be notified of this and the nature of the contamination. Reasonable effort will be expended to decontaminate the victim prior to removal from the site. The medical facilities will be notified of the intended scope of work and the potential for contaminated personnel. The medical facilities will receive copies of all the Material Safety Data Sheets (MSDSs) and/or NIOSH Pocket Guides where available and applicable to this project. The MK SSHO shall contact the medical facility to establish a contact person for the necessary information.

### 12.8 EMERGENCY MEDICAL TREATMENT AND FIRST AID

See Section 11.

### 12.9 COMMUNICATIONS

The MK SSHO, the MK General Superintendent and the Subcontractor Job Supervisor(s) at each work site area shall be equipped with two-way radios for communications on site as warranted. Emergency Communications equipment will be provided by MK. Additional communications with outside emergency services will be accomplished through the use of cellular telephones if necessary. Both two way radios and cellular phones are to be used for emergency's only. In the radios will be used for standard field construction communication, then the MK SSHO shall establish strict protocols for radio communication and insure all personnel who carry radios understand the protocols.

### 12.10 CRITIQUE OF RESPONSE AND FOLLOW-UP

All actual emergencies shall be critiqued and follow-up corrective actions shall be implemented as needed. Drills and exercises if completed shall also be critiqued. The critique will be conducted as part of a safety meeting first by supervisory personnel and second with all MK and Subcontractor personnel.

### 12.11 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All emergencies will be promptly reported to the Emergency Response Number x3300, the Environmental Department (x1132, x3114, or x6160), and to the MK SSHO at 812-854-6941 or portable radio Unit 0004. The MK SSHO will assure that the Navy designated authority is notified promptly and directing initial emergency response actions until the arrival of the NSWC Crane designated authority. The designated authority can include the resident officer in charge of security, fire department and/or ambulance services or the Environmental Protection Department Manager.

The following contains the initial response actions to be taken by MK personnel and subcontractors at the work site for the type of incident incurred.

A. Incident Type: Fires in Vehicles and Mobile Equipment, Process Equipment, and Support Structures.

Response Actions:

- 1. Notify the NSWC Crane Security Desk at extension 3300, and provide the following information:
  - a. The name and phone number of the person making the call.
  - b. The location of incident.
  - c. The type of incident.
  - d. Injured or trapped personnel and any potential material release.
- 2. MK SSHO or Supervisor designates one person to meet the emergency response units at the nearest road where the units will be approaching.
- 3. MK SSHO or Supervisor assumes initial command of the situation and directs personnel to do one of the following:
  - a. Emergency shutdown of process equipment or mobile equipment, evacuate the work zone or immediate area to a safe place of refuge, meet the incoming response units and provide all available information.
  - b. Initiate first fire attack and knockdown using available fire extinguishing equipment followed by evacuating the work zone or immediate area.
- B. Incident Type: Preparation for Adverse Weather Condition to Include High Winds, Tornado, Heavy Rains, Snow and Ice Conditions.

  Response Actions:
- 1. MK SSHO or Supervisor notifies the NSWC Crane Security Desk at extension 3300 and provides the following information:
  - a. The name and phone number of the person making the call.
  - b. The location of the work site(s).
  - c. Preparation for adverse weather condition has begun.
  - d. Permanent structure location where personnel will be relocating to on Base.
- 2. MK SSHO or Supervisor will direct personnel to shutdown operations, secure loose materials, and park and secure mobile equipment. Personnel shall be directed to report to a permanent building after completing decontamination procedures.
- 3. MK SSHO or Supervisor will complete accountability and await clearance from Base Security to resume operations or other action.

- C. Incident Type: Medical and Rescue Emergencies. Response Actions:
- 1. Notify the NSWC Crane Security Desk at extension 3300 and provide the following information:
  - a. The name and phone number of the person making the call.
  - b. The location of incident.
  - c. The type of incident.
  - d. Injured or trapped personnel and any exposure to hazardous material.
- 2. MK SSHO or Supervisor designates one person to meet the emergency response units at the nearest road where the units will be approaching.
- 3. MK SSHO or Supervisor assumes initial command of the situation and completes or directs personnel to do one or both of the following:
  - a. Emergency shutdown of process equipment or mobile equipment and any other necessary action to mitigate or control the incident.
  - b. Initiate emergency first aid actions until arrival of emergency units.
- D. Incident Type: Mobile vehicle accident or incident during transport from work area to Bioremediation Facility.

Response Actions:

- 1. Notify the NSWC Crane Security Desk at extension 3300 and provide the following information:
  - a. The name and phone number of the person making the call.
  - b. The location of incident.
  - c. The type of incident.
  - d. Injured or trapped personnel and estimate of material released.
- 2. MK SSHO or Supervisor designates one person to meet the emergency response units at the nearest road where the units will be approaching.
- 3. MK SSHO or Supervisor assumes initial command of the situation and directs personnel to do the following:
  - a. Cordon off the accident/spill area.
  - b. Cover the spilled contaminated soils with canvas tarps or visqueen.
  - c. Install temporary Environmental Protection and/or Erosion Control measures to contain potential surface run-off contamination.

## 13.0 LOGS, REPORTS, AND RECORDKEEPING

#### 13.1 SAFETY AND HEALTH LOGBOOK

The MK SSHO shall maintain a Project Safety and Health Logbook for the duration of work activities at the site. Entries in the logbook shall be time sequenced. The entries must be written in ink and the bottom of each page must be signed. The logbook shall be hard bound. No pages will be removed from the log book. Corrections must be lined out and initialed. The logbook will contain specific information recorded on a daily basis utilizing the Form shown in Figure 4. The logbook will contain specific information on safety and health activities and to further describe or clarify information recorded on the Figure 5, the SSHP Daily Logbook Report form.

A separate file folder shall be maintained for Figure 4. Separate file folders shall be established for this SSHP; calibration data sheets if not attached to Figure 4; safety and IH instrument serial numbers and shipping papers; field specific safety and health procedures; all safety and health related permits; and weekly safety inspections. Records of training and site orientations; briefings including pre entry briefs; Subcontractor prepared equipment inspection sheets and exclusion zone sign-in and sign-out logs shall also be maintained in file folders by the MK SSHO. In addition, the MK SSHO shall copy and file all receipts for MK equipment rentals and consumables upon delivery to the site and the inventory shall be verified as acceptable.

### 13.2 REPORTS

A weekly site safety and health inspection report shall be prepared by the SSHO. This report shall identify work activities, safety and health-related deficiencies, and corrective measures. As a minimum, the checklist shown in Figure 5 shall be completed by the MK SSHO. All near miss incidents and incidents that result in property damage, personnel injuries or illness will be investigated and notification/reporting requirements shall be followed in accordance with PHSP 04.1.

## 13.3 FIELD MASTER COPY OF SSHP

The MK SSHO shall maintain a field master copy of this SSHP document to include all redlines and the completed work zone maps. This copy shall be properly filed with project records at the completion of the project to be sent to MK PMO office in Charleston.

### 13.4 RECORDKEEPING

The MK SSHO shall maintain records of all injuries and illnesses for MK employees only incidental to the work in accordance with 29 CFR 1904, including copies of the Worker's Compensation First Report of Injury. Accidents and Incidents data reporting requirements shall be managed in accordance with Program Procedure PHSP-04.1 for both MK and Subcontractor personnel as stated in Section 11.3.

The MK SSHO shall receive copies of all records for injuries and illnesses of Subcontractors incidental to the work, including copies of the Worker's Compensation First Report of Injury. These records will be maintained on the Subcontractors OSHA 200 Log. Per the contract General Conditions (GC) 13(c), the Subcontractor shall provide a monthly project safety review form and attach with it a copy of its OSHA 200 Log specific to this project. The MK SSHO shall insure that information on Subcontractor exposure hours is provided to the MK SouthDiv Health and Safety Manager on a monthly basis. A record of all first aid treatments not otherwise recordable shall be maintained and furnished to MK or the Navy's designated authority upon request. Monitoring and sampling results shall be managed as stated in Section 7.5 of this plan.

### 13.5 SAFETY AND HEALTH PROJECT COMPLETION REPORT

The MK SSHO shall complete a safety and health project completion report at the conclusion of the field work. The purpose of the report is to a self assessment summarizing effectiveness of the safety and health program implemented in the field; lessons learned and suggestions for program improvement; accident and incidents; air monitoring and sampling results including ratings on instrument useability; and how well the original prepared AHA worksheets reflected field conditions. The report shall be directed to the MK SouthDiv Program Health and Safety Manager within ten working days after project demobilization.

# 14.0 ON-SITE WORK PLANS

A Site-Specific Work Plan of which this document is designated a supplement to was developed to define the work tasks and identify the work objectives. The means and personnel required to complete the task is identified along with consideration for methods, logistics, quality control/assurance and resources. An Operational Plan for the Bioremediation Facility has been prepared to provide operational guidance, parameters and safety considerations for pilot scale and full scale operations.

# 15.0 COMMUNICATION PROCEDURES

## 15.1 RADIO COMMUNICATION, TELEPHONE, ALARMS AND DRILLS/EXERCISES

Refer to Section 12.10 of this Plan. Cellular telephones shall be selected as a secondary choice of emergency communication. An emergency alarm, such as an air horn, shall be available if necessary at each major work site to warn personnel of an emergency. Personnel shall be trained on what actions they are to take if the alarm is sounded to include evacuation routes and assembly points. Drills and exercises shall be conducted to ensure that communication methods are adequate. The MK SSHO will test the two way communication for confirmation of emergency communication using NSWC Crane protocols.

## 16.0 SPILL CONTAINMENT PLAN

### 16.1 GENERAL

Spill and release accident scenarios during remediation could occur and involve residue process material and reinstates from decontamination activities. The following information will be used by project personnel to respond to and mitigate any releases on the project site.

In the event of a spill or release, the MK SSHO, MK General Superintendent and/or Subcontractor Job Supervisors will direct all personnel to take appropriate action which could include any one or all of the following:

- Initiate spill response action and notify emergency services.
- Notify emergency services as identified in Table 3.
- Evacuate the work zone to a safe place of refuge.

### 16.2 PREPLANNING FOR SPILL CONTROL

Remedial construction activities will be reviewed for release potential and the capability of on-site personnel to adequately respond. Base personnel will be contacted to determine their capability to respond to various releases. All aspects of the Emergency Response Plan as described in Section 12, will be reviewed by site personnel to ensure adequacy and that resources are available.

During mobilization activities for this project, the MK Project Manager, MK SSHO, MK General Superintendent shall review the Program Procedure PHSP 03.1 and the Base Oil and Hazardous Substances Spill Contingency Plan. After review, they shall execute the steps necessary to assure effective spill response planning requirements and resources are established for this project.

MK will cooperate with the base; other site contractors; and federal, state and local directors of emergency preparedness and response to ensure a coordinated effort in preparing for a spill emergency, with response plans that are compatible and integrated. Prior to the start of work, MK will review PHSP 03.1 and meet with site representatives on spill control and assure the SSHP is consistent with site requirements for spill control. Specific roles and responsibilities will be reviewed for MK and Navy personnel. The Base Fire Department will be notified of any spills classified above incidental and will assist in spill containment. The Base Response Team (SRT) will provide overall command and control of the clean-up activity for spills classified above incidental until relieved by a higher authority.

### 16.3 SPILL AND FIRE CONTROL MATERIALS AND EQUIPMENT

When planning to move or handle drums (or other containers) containing hazardous or special waste materials, the following shall be kept available in areas where spills, leaks or ruptures may occur: 1) salvage drums or containers (approved by the U.S. Department of Transportation); 2) suitable quantities of proper absorbent materials; 3) portable containing material; 4) neutralizing agents; and 5) fire extinguisher(s).

Drums and containers used during a clean-up will be appropriate to the hazardous substances they are meant to contain, and will meet the regulations promulgated by DOT, 49 CFR Parts 171-179, OSHA, 29 CFR 1910.120, and EPA 40 CFR 262. Drums and containers will be inspected for defects and their integrity assured prior to being filled with any non-solid hazardous or special waste substance.

A spill of material can be contained with porous or absorbent barriers. Absorbent materials can take several configurations (pillows, sheets, booms, loose chips, particle beads, and fibers) that may be set in place, or scattered by hand. Preferred sorbents are inert nonreactive clay minerals (neutralizing agents may be added), or specific formulations which provide automatic neutralization or vapor control.

### 16.4 SPILL CONTROL MEASURES

Stopping the leak or spill at its source may involve turning off pumps or closing valves. Returning a container to an upright position, transferring wastes to other containers, or moving containers to less dangerous locations may, in some circumstances, be possible, but should not be attempted if the identification of the substance is not known unless Level A PPE Protection is worn and decontamination stations have been established. Similarly, the patching of an active leak is not advised until an initial "Size-Up" of the situation is made and guidance established in Section 16.6 has been followed.

## 16.5 DRUM, CONTAINER, AND TANK HANDLING AND MOVING PROCEDURES

Drums, containers, and/or tanks of hazardous or special waste substances will not be moved until the requirements for preparations described in a task work plan and SSHP have been completed (i.e., all required equipment and materials are at the work site ready for use, and the employees have been familiarized with their responsibilities, the emergency response procedures, and the potential hazards associated with the contents of the drums and containers).

Work site operations will be organized to minimize the amount of drum or container movement. Each drum or container will be inspected before it is moved to ensure that it can be handled without suffering a rupture or puncture, and relocated without having the contents spill or leak.

Unlabeled or unmarked drums and containers will be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Drums and containers under pressure, as evidenced by bulging or swelling, will not be moved until such time as the cause for excess pressure is determined and appropriate containment procedures have been implemented to protect employees from explosion.

Equipment used to handle the drums and containers will be selected, positioned, operated, and maintained to minimize any contact that could rupture, puncture, dent, or drop drums and containers holding hazardous or special waste substances, and the potential for equipment ignition sources to ignite vapors released from ruptured drums or containers shall be controlled.

Drums and containers that cannot be moved without rupture, leakage or spillage will be transferred to a sound container using a device specified for the material being transferred. During liquid transfer of flammable or combustible liquids, bonding and grounding equipment shall be utilized.

#### 16.6 INITIAL REPORTING AND MANAGEMENT OF INCIDENTS

All spill emergencies classified above incidental shall be promptly reported to the Emergency Response Number x3300, the Environmental Department (x1132, x3114, or x6160), and to the MK SSHO at 812-854-6941 or portable radio Unit 0004. The MK SSHO will assure that the Navy's Technical Representative (NTR) or ROICC is notified promptly.

**Incidental Release (defined)** - a release of hazardous material where the substance can be absorbed, neutralized, or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel. In addition, the quantity of released material does not exceed EPA Reportable Quantities.

The MK SSHO, the MK General Superintendent and the Subcontractor Job Supervisor(s) are responsible for directing initial emergency response actions until the arrival of the NSWC Crane designated authority. The designated authority can include the officer in charge of security, fire department and/or ambulance services.

The following contains the initial response actions to be taken by MK personnel and Subcontractors at the work site for spill and release emergencies:

#### **Response Actions:**

1. Classify spill as Incidental or an Emergency.

- 2. If Incidental (as defined above): 1) notify immediate supervisor; 2) assess hazard potential, establish precautions and PPE requirements; 3) begin clean-up of spill.
- 3. If Emergency, initiate response action in accordance with the following steps:
  - A. Quickly assess probability of safely stopping spill. If physical, chemical, or biological health hazards exist, immediate evacuate the area to a safe distance upwind and upgrade from the spill.
  - B. Notify the Crane Security Desk at X 3300 and provide the following information:
    - 1. Name and phone number of person calling;
    - 2. Location of incident;
    - 3. Type of incident;
    - 4. If anyone is injured or trapped and the estimated volume of material released.
  - C. MK SSHO, MK PM or Subcontractor Job Supervisor(s) designates one person to meet the emergency response units at the nearest road where the units will be approaching.
  - D. MK SSHO, MK PM or Subcontractor Job Supervisor(s) assumes initial command of the situation and directs personnel to do one of the following:
    - Emergency shutdown of process equipment or mobile equipment, evacuate the work zone or immediate area to a safe place of refuge and meet the incoming response units and provide all available information.
    - Initiate initial spill response using available spill response equipment only for small emergency spill events where personnel are trained to mitigate. Evacuate the work zone or immediate area if there are any health threats or risks to personnel.
    - 3. MK's PM or designee shall immediately notify the Navy's Designated Authority and the MK PMO. The Navy's Designated Authority is the ROICC assigned to this project.

# 17.0 CONFINED SPACES

Permit-required confined space entry is not anticipated on this project. If entry is required in an excavation that is greater than 5 feet in depth, the excavation must be treated initially as a permit-required confined space. Atmospheric monitoring must be completed before the excavation can be downgraded to nonpermit-required confined space. Engineering controls must be in place to safeguard the excavation from collapse. Any confined space entry must follow MK Procedure 9.0 found in the Industrial Hygiene Procedures Manual (MK 1994a).

# **TABLES**

	Table 1 Site Description and Contaminants							
ldentifier	Location/Description	Scope of Work	Contaminants					
SWMU 03/10	Ammunition Burning Ground (ABG), eastern portion of NSWC.	Soil excavation and transport to Bioremediation Facility, site restoration, and soil sampling.	Residues of 2,4 DNT, 2,6 DNT, TNT, Tetryl, DNB, RDX, HMX, antimony, cadmium, chromium, copper, and lead in soils.					
SWMU 10/15	Rockeye, north central portion of NSWC.	Soil excavation and transport to Bioremediation Facility, site restoration, and soil sampling.	Residues of TNT, HMX and RDX in soils. Low levels of metals, cyanide, methylene chloride and PCBs.					
SWMU 13/14	Mine Fill B, east of SWMU 12/14.	Soil excavation and transport to Bioremediation Facility, site restoration, and soil sampling.	Residues of TNT, HMX, RDX, 2,4 DNT, TNB, antimony, beryllium, arsenic, cadmium, chromium, lead, copper, nickel, zinc, barium, aluminum, cobalt, iron, magnesium.					
SWMU 12/14	Mine Fill A, west central portion of NSWC.	Soil excavation and transport to Bioremediation Facility, site restoration, and soil sampling.	Residues of TNT, HMX and RDX in soils. Also PCB contamination in soils, Aroclor 1242, 1254, and 1260.					
Bioremediation Facility	To be located east of Bunker 828 off H-280 in the east central area of NSWC.	Soil excavated from SWMU 03/10, 10/15, 12/14, and 12/13 will be processed at this facility using composting technology.	Contaminants in Soil to be processed at this facility are listed in Section 1.3. Amendments for mixing with soil may include alfalfa and animal manure.					

Table 2 **Potential Contaminants** 

Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
Arsenic	Metal: silver gray or tin white, brittle, odorless solid.	OSHA PEL 10 ug/m³ as 8 hr TWA.	Dermal, GI disturbances by skin absorption, peripheral neuropathy and respiratory irritant by direct contact, ingestion causes hyper pigmentation of skin, inhalation causes ulceration of nasal septum.	Irrigate eyes immediately with water. Soap wash skin promptly. Seek medical attention immediately.
Aluminum	Metal: silvery, ductile, odorless solid.	OSHA PEL 15 mg/m³ as 8 hr TWA for total dust.	Upper respiratory irritant. Reported to have caused pulmonary fibrosis. Relatively inert material.	Provide respiratory support.
Antimony	Metal: silver-white, lustrous, hard, brittle solid; scale like crystals; or a dark gray, lustrous powder.	OSHA PEL 0.5 mg/m³ as 8 hr TWA.	Irritant to noise, throat and mouth by inhalation. Skin or eye contact causes cough; dizziness; stomach cramps and unable to smell properly.	Irrigate eyes immediately with water. Soap wash skin promptly. Seek medical attention immediately.
Barium	White odorless solids, soluble compounds may be liquid compounds.	OSHA PEL 10 mg/m³ as 8 hr TWA.	Upper respiratory irritant. Irritant to eyes and skin. Ingestion causes gastroenteritis, muscle spasm.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Beryllium	Metal: a hard brittle, grey- white solid.	OSHA PEL 2 ug/m³ as 8 Hr. TWA.	Irritant to eyes and mucous membranes, causes respiratory symptoms, weakness, fatigue and weight loss.	Irrigate eyes immediately with water. Soap wash skin promptly. Seek medical attention immediately.

Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
Carbon Dioxide, off-gas component of aerobic composting.	Colorless, odorless gas.  Normal constituent of air, about 3,000 ppm.	OSHA PEL of 5,000 ppm.	Cause headache, dizziness, restlessness; dyspnea, increased heart rate, pulse and blood pressure; convulsions and asphyxia at high concentrations	Provide respiratory support. Seek medical attention immediately.
Cadmium	Metal: silver-white, blue- tinged lustrous, odorless solid.	OSHA PEL 2.5 ug/m³ as 8 hr TWA.	Inhalation causes pulmonary edema, dyspnea, cough and chest pain. Ingestion causes chills, muscle aches, nausea, vomiting and diarrhea.	Irrigate eyes immediately with water. Soap wash skin promptly. Seek medical attention immediately.
Chromium metal	Blue white to steel gray, lustrous, brittle, hard solid	OSHA PEL 0.5 mg/m³ as 8 hr. TWA	Histologic fibrosis of lungs by inhalation. Causes sensitive dermatitis. Poison by ingestion.	Irrigate eyes immediately with water. Soap wash skin. Provide respiratory support. Seek medical attention immediately.
Cobalt metal, dust and fume	Metal: odorless, silver-gray to black solid.	OSHA PEL 0.1 mg/m³ as 8 hr. TWA	Cause cough, shortness of breath, decrease of pulmonary function by inhalation route. Ingestion and direct contact causes dermatitis, diffuse nodular fibrosis, and weight loss.	Irrigate eyes immediately with water. Soap wash skin. Provide respiratory support. Seek medical attention immediately.

Table 2
Potential Contaminants

Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
Copper metal dusts and mists	Metal: reddish, lustrous, malleable, odorless solid.	OSHA PEL 1 mg/m³ as 8 hr. TWA	Irritant to the nasal mucous membranes and pharynx; may cause nasal perforation; eye irritant; metallic taste; dermatitis.	Irrigate eyes immediately with water. Soap wash skin. Provide respiratory support. Seek medical attention immediately.
Cyanide	White granular or crystalline solids with a faint almond- like odor.	OSHA PEL 5 mg/m³ as 8 hr. TWA	Acute inhalation (high concentrations, pure substances) can cause asphyxia and death. Absorption causes weakness, headache, confusion, nausea, vomiting, increased respiratory rate. Irritant to eyes and skin.	Irrigate eyes immediately with water. Soap wash skin. Provide respiratory support. Seek medical attention immediately.
Iron (oxides)	Reddish brown solid.	OSHA PEL 5 mg/m³ as 8 hr. TWA	Relatively inert material. Repeated exposures by inhalation can cause benign pneumonoconiosis.	Provide respiratory support.
Lead	A heavy, ductile, soft grey solid. Noncombustible solid. (May be in soil as a biodegraded product of leaded gasoline.	OSHA PEL 50 ug/m³ as 8 Hr. TWA	Weakness, lassitude, and insomnia. Facial pallor, anorexia, low weight, and malnutrition. Constipation, abdominal pain and colitis. Anemia, gingival lead line, tremor, Encephalopathy, Nephropathy. Irritant to eyes. Hypertension.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.

Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
Magnesium	Finely divided white particulate.	OSHA PEL OSHA PEL 15 mg/m³ total dust as 8 hr. TWA		Provide respiratory support.
Methylene Chloride	Colorless liquid with a chloroform-like odor. Combustible liquid.	OSHA PEL 500 ppm as 8 Hr. TWA ACGIH TLV 50 ppm as 8 Hr. TWA	Irritation to eyes and skin. fatigue, weakness, somnolence, lightheadedness, numbness, tingle limbs, nausea, potential occupational carcinogen.	Irrigate eyes immediately with water. Soap wash skin. Provide respiratory support. Seek medical attention immediately.
Hydrogen Sulfide (May be off gas component of composting)	Colorless gas with a strong odor of rotten eggs.	OSHA Ceiling of 20 ppm, NIOSH Ceiling of 10 ppm.	Irritant to eyes and respiratory system. Causes dizziness, headache and eye pain. CNS depressant. Asphyxiant.	Irrigate eyes immediately with water. Provide respiratory support. Seek medical attention immediately.
Trichloroethylene	Colorless liquid with a sweet chloroform-like odor. Class IC flammable liquid, but burns with difficulty.	OSHA PEL 50 ppm as 8 Hr. TWA OSHA 15-min STEL 200 ppm	Eye and skin irritant.  Headache, vertigo, visual disturbance, tremors, somnolence, nausea, liver injury, vomiting, , dermatitis, cardiac arrhythmia, potential occupational carcinogen.	Irrigate eyes immediately with water. Wash skin promptly with soap and water. Provide respiratory support. Seek medical attention immediately.

Table 2 **Potential Contaminants** 

				, — — — — — — — — — — — — — — — — — — —
Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
Tetrachloroethene	Colorless liquid with a mildly sweet chloroform-like odor. Noncombustible liquid, but decomposes in a fire to hydrogen chloride and phosgene.	OSHA PEL 100 ppm as 8 Hr. TWA ACGIH TLV of 50 ppm as 8 Hr. TWA	Eye, nose, and throat irritant. Nausea, flushed face, vertigo, dizziness, incoherence, headache, skin erythema, liver damage, Potential occupational carcinogen.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately
DNB (Dinitrobenzene, all isomers)	Pale white or yellow solids.	OSHA PEL 1 mg/m <sup>3</sup> as 8 hr. ACGIH 8 hr TWA of 1.0 mg/m <sup>3</sup>	Causes anoxia; cyanosis; anemia; jaundice; visual disturbances; bad taste; burning mouth; reproductive effects; suspected human carcinogen.	Irrigate eyes immediately with water. Water flush promptly. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
DNT (Dinitrotoluene)	Orange-yellow crystalline solid with a characteristic odor.	OSHA PEL 1.5 mg/m³ as 8 hr. ACGIH 8 hr TWA of 0.15 mg/m³	Causes anoxia; cyanosis; anemia; jaundice; reproductive effects; suspected human carcinogen.	Irrigate eyes immediately with water. Water flush promptly. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
HMX (Cyclotetramethylenetetrani tramine) See Note 1	White-crystalline solid.			
RDX (Cyclonite)	White crystalline powder, combustible solid.	OSHA PEL 1.5 mg/m³ as 8 hr. ACGIH 8 hr TWA of 1.5 mg/m³	Skin, eye and respiratory irritations. Very similar to TNT.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately

Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
TNB (Trinitrobenzene) Refer to TNT				
TNT (Trinitrotoluene)	trotoluene)  Colorless to pale yellow, odorless solid or crushed  Andrew Combustible solid  of 0.5 mg/m³		Causes liver damage, jaundice; cyanosis; sneezing; cough; sore throat; peripheral neuropathy; muscle pain, kidney damage; cataract; sensitive dermatitis; leukocytosis; anemia and cardiac irregularities.	Irrigate eyes immediately with water. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.
Tetryl	odorless, crystalline solid.		Causes sensitive dermatitis, itching, erythema, edema on nasal folds, cheeks and neck; keratosis; sneezing; anemia; fatigue, cough; irritability, headache; lassitude; insomnia, nausea and vomiting.	Irrigate eyes immediately with water. Water flush promptly. Soap wash skin promptly. Provide respiratory support. Seek medical attention immediately.

Potential Contaminant	Description	Exposure Limits	Signs and Symptoms	First Aid
Biological constituents to include total bacteria, E. Coli, and fungi (yeasts and molds). Constituents will be present in amendments and may become airborne during composting operations.	Microscopic organisms	None established, will compare to background levels.	Varies, depending on sensitivity. Can include respiratory system irritation, distress and infections.	Remove from source, seek medical attention.

Data is Table derived from NIOSH 1994, OSHA 1994, and ACGIH 1994-1995. Note:

Note 1: Significant data not found, similar concerns as compared to TNT.

Table 3 Personnel Names and Telephone Numbers

Contact	Person or Agency	<u>Telephone</u>
Fire Department	NSWC Fire Department (Base)	3300 emergency (812) 854-1235
Ambulance Service	NSWC Ambulance (Base)	3300 emergency (812) 854-1100
Law Enforcement	NSWC Security (Base)	(812) 854-3318
Robert Hlavacek	MK Program Manager (MK PMO)	(803) 554-9367
Scott Newman	MK Senior Project Manager (MK PMO)	(803) 554-9369
Steve Downey	MK Site Project Manager	Office: (812) 854-6941
Robert Porter	MK Site Superintendent	Office: (812) 854-6941 Home: (812) 863-7173
Robert Porter	MK Site Safety and Health Officer	Cellular: (812) 639-8356 Unit 0004 radio
Bill Kemp	MK Site Quality Assurance/Quality Control Supervisor	Office: (812) 854-6941
William Piispanen	MK Health and Safety Program Manager	(208) 386-5930
Cmdr. Larry Laws	NSWC Crane PWD/Eng. Dept	(812) 854-1834
Capt. J.M. Carney	NSWC Base Commander	(812) 854-1210
Jim Hunsicker or Tom Brent	NSWC Environmental Protection Services	(812) 854-6160
Adrienne Townsel-Wilson	SOUTHNAVFACENGCOM	(803) 743-0582
Brent Robertson	ROICC(NTR)	(812) 854-3318
Lt. Dale Eads	NSWC E.O.D. (Base)	(812) 854-3456
Dale Groh	NSWC Safety Directory	(812) 854-3601
Poison Control Center	Poison Control Center	(800) 942-5969
National Response Center	National Response Center	(800) 424-8802
Regional USEPA	USEPA (Region 5) Emergency State of Indiana Emergency	(312) 353-2318 (317) 233-7745

Table 2 Personnel Names and Numbers (continued)

Contact	Person or Agency	<u>Telephone</u>
Hospital	NSWC Base Medical Facility Head Nurse (Mary Muessig)	(812) 854-1220 (812) 854-4319
Hospital	Bedford Medical Center 2900 West 16 th Street Bedford, IN 47432	(812) 275-1200
Hospital	Bloomington Hospital 601 West Second Street Bloomington, IN	(812) 336-9515
Utility Locator Service	Public Works Dept.	(812) 854-1834

#### **Directions to NSWC Medical Department On-site:**

The NSWC Fire Department coordinates the on-site ambulance service. The Medical Department is located in Building 12, off of H-2 just north of H-5.

#### **Directions to Bedford Medical Center:**

From Main Gate, head east on Highway 58 to the city of Bedford, then turn left onto 16th Street. Distance to hospital is approximately 20 miles. From Bedford Gate, head east on 158 to the City of Bedford. 158 turns into 16th Street.

#### **Directions to Bloomington Hospital:**

Exit NSWC Crane on H5-45 through the Bloomington Gate, then follow Highway 45 North to Bloomington. At the intersection of Highway 45 and Highway 37, continue straight ahead over the bypass (Bloomfield Road), and follow Bloomfield Road north until it becomes 2nd Street. Continue on 2nd Street and the hospital will be on right-hand side of the road.

Note: MK SSHO is to ensure this Table and Figure 1 are included with the Work Zone Maps posted at the job site. In addition, the Table and Figure must be posted at each office location. Table 3 must be updated by the MK SSHO to include all subcontractor points-of-contact.

Notify the MK SSHO of any changes in work conditions which may affect the health and safety aspects of the task. The Superintendents or designated supervisors are responsible for conducting Plan-of-the-Day meetings, Pre-Entry and Post-Entry Briefings were necessary, weekly safety meetings, and conducting or ensuring that other training is completed.

# Table 4 Training Requirements

ldentifier	Location	40-Hr. Haz. Waste	Haz. Waste Annual Ref.	Haz. Waste Super- visor	Weekly Safety Mtg.	Haz. Com.	Metals	CPR/ First Ald	Respir a-tory Protec- tion	Confine d Space	Site- Specific	POD, Pre- & Post- Entry Brief	Other
SWMU #03/10	Ammunition Burning Ground	Y	Y	Y	Y	Y	Y¹	Y	Y	<b>Y</b> <sup>2</sup>	Y	Y	<b>Y</b> 3
SWMU #10/15	Rockeye	Y	Y	Υ	Y	Y	Y¹	Y	Y	Y²	Y	Y	Υ3
SWMU #13/14	Mine Fill B	Y	Y	Y	Y	Y	Υ¹	Υ	Y	<b>Y</b> <sup>2</sup>	Y	Y	Y3
SWMU #12/14	Mine Fill A	Y	Y	Y	Υ	Y	N	Y	Y	Y <sup>2</sup>	Y	Υ	Y3
Sampling	All locations	Y	Υ	Y	Y	Υ	Y¹	Y	N	Υ²	Y	Y	Y <sup>3,4</sup>
Construction of facility	Bioremediation Facility	N	N	N	Y	Y	N	Y	0	0	Y	Y	O <sub>3</sub>
Soil and wastewater sampling	Bioremediation Facility	Y	Y	Y	Y	Y	Υ¹	Y	Y	O²	Υ	Y	Y <sup>4</sup>
Start-up and operation of facility	Bioremediation Facility	Y	Y	Y	Y	Y	Υ¹	Y	Y	O²	Y	Y	Y <sup>3</sup>

Y = Yes, N = No, 0 = Optional

Notes:1 - Employee hazard communication on lead; employee hazard communication on cadmium per 1926.1127, hazard communication on inorganic arsenic per 1926.1118. Employee hazard communication on the other metals per MK IH Manual Procedure 12.

- 2 Excavations greater than 5 feet in depth should be treated as permit required confined spaces until atmospheric monitoring proves it can be downgraded to non permit required confined space and engineering controls on excavation design are in place.
- 3 Competent person per 29 CFR 1926, Subpart P, Excavations.
- 4 49 CFR Part 172 Subpart H for personnel required to classify, mark, select packaging, inspect, load and transport hazardous materials.

Table 5 Selection of Personal Protective Equipment						
PPE	Level D	Modified Level D	Level C	Level B		
Coveralls or other approved working apparel	Yes	Optional	Optional	Optional		
Chemical-resistant clothing (coveralls; hooded, one- or two- piece chemical-resistant coveralls)		Yes				
Chemical-resistant clothing (coveralls; hooded one- or two- piece chemical splash suit; chemical-resistant hood and apron; disposal chemical-resistant coveralls)			Yes			
Chemical-resistant clothing (coveralls and long-sleeved jacket; one- or two-piece chemical splash suit; disposal chemical-resistant one-piece suit)				Yes		
Boots, leather or chemical resistant, protective toe and steel shank meeting ANSI Z41.1 (29 CFR 1926.28(a).	Yes					
Boots (inner), chemical resistant, protective toe and shank meeting ANSI Z41.1 (29 CFR 1926.28(a)).		Yes	Yes	Yes		
Boot covers (outer), chemical resistant (disposable)		Optional	Optional	Optional		
Safety glasses or chemical splash goggles, meeting ANSI Z87.1-1979 for "Industrial Safety Glasses"	Yes	Yes	Yes			
Face shield	Option al	Optional	Optional	Optional		
Gloves (cotton/leather)	Option al					
Gloves (inner), chemical resistant or liners		Optional	Yes	Yes		
Gloves (outer), chemical resistant		Yes	Yes	Yes		
Long underwear		Optional	Optional	Optional		
Hardhat	Yes	Yes	Yes	Yes		
Positive pressure, full-facepiece with nose cup, self- contained breathing apparatus (SCBA) or positive pressure, supplied-air respirator with escape SCBA (MSHA or NIOSH approved) (Note: escape SCBA may not be required)				Yes		
Air-purifying respirator, half-face or full face with suitable cartridge (MSHA or NIOSH approved)			Yes			

Note: Optional requirements to be determined by the MK SSHO based on additional evaluation of site conditions and hazards analysis. Note: safety glasses not required when wearing full-face APR.

Table 6 Minimum Personal Protective Equipment Requirements by Task							
Site	Activity	PPE					
Soil excavation at SWMU #03/10	Excavate, screen, and load soils for Composting     Site restoration     Decontamination and rock washing	Level C, modify based on air monitoring/sampling results     Level D     Level C					
Soil excavation at SWMU #10/15	<ol> <li>Excavate, screen, and load soils for Composting</li> <li>Site restoration</li> <li>Decontamination and rock washing</li> </ol>	Level C, modify based on air monitoring/sampling results     Level D     Level C					
Soil excavation at SWMU #13/14	<ol> <li>Excavate, screen, and load soils for Composting</li> <li>Site restoration</li> <li>Decontamination and rock washing</li> </ol>	Level C, modify based on air monitoring/sampling results     Level D     Level C					
Soil excavation at SWMU #12/14	Excavate, screen, and load soils for Composting     Site restoration     Decontamination and rock washing	Level C, modify based on air     monitoring/sampling results     Level D     Level C					
SWMU Sampling	Obtain soil and/or groundwater samples	1. Modified Level D					
0							

1. Level D, modified where necessary

by the MK SSHO dependent on

1. Modified Level D, use approved dust

2. Modified Level D, use approved Dust

3. Level C, modify where necessary

4. Level C, modify where necessary

during windrow turning.

Mask during loading.

7. Modified Level D.

necessary.

5. Modified Level D, use approved Dust

6. Modified Level D, use approved Dust

8. Modified Level D, modify where

9. Level D, modify per task based on manufacturer's recommendation.

Mask. Level C if working in building

construction task.

Mask.

1. Site preparation, construction and instal

lallation of equipment

4. Turn and mix windrows

1. Ofload and grind amendments

2. Load amendment blend in windrows

3. Offload contaminated soil into windrows

5. Monitor windrow parameters and field

screening/confirmation sampling

7. Decontamination water management

9. Maintenance and Upkeep of Equipment

8. Composting building housekeeping

6. Load and transport treated soils

Level C respiratory protection includes half-mask respirator with HEPA cartridges. Protective suits are standard tyvek. Either rubber boots or latex shoe covers can be used. Either rubber, vinyl coated or latex gloves (15-20 mils) can be used. Dust Masks should be 3M Brand 8710 Dust/Mist Respirator or equivalent.

Construction of

Bioremediation

Facility

Start-Up and

Operations of Bioremediation

Facility

Table 7	
Airborne Contaminant Response	Criteria

Contaminant	Level	PPE	Monitoring Frequency	Actions Taken
Volatile organic compounds. Both direct reading and time integrated samples will be obtained. Time integrated samples will be obtained at the compost facilities. Level C PPE will be used at excavation sites and the composting facility. APR's selected are HEPA but can be modified to include organic cartridges also depending on VOC levels. Frequency of monitoring is subjected to change as field experience is obtained.	No more than 5 ppm above background, no benzene detected	Level D or modified Level D	Prior to each shift and reentry following 30 minute vacancy or as warranted	Continue periodic monitoring
	Greater than 5 ppm above background but less than 10 ppm above background. No benzene detected, no Action Level for any organic exceeded.	Level D or Modified Level D	At least once every hour, when change in operation occurs, or when requested by workers	Monitor for benzene or other organics. Continue periodic monitoring
	Greater than 10 ppm above background or benzene detected or Action Level exceeded for any organic.	To be determined by SSHO	To be determined by SSHO	Stop work and notify SSHO

Table 7 Airborne Contaminant Response Criteria									
Contaminant Level PPE Monitoring Frequency Actions Taken									
Lead (inorganic)	Less than action level for lead (30 µg/m³) and/or no visible observation of excessive dusts	Level C	Periodic per plan	Continue monitoring and/or sampling and observations					
	Greater than action level or visible observation of excessive dusts.	Level C or as determined by SSHO	Representative personnel sampling and monitoring to be conducted or continued	Stop work and notify SSHO					
	Greater than OSHA PEL or greater than 10 mg/m³ total dust.	As determined by SSHO	Representative personnel sampling and monitoring to be conducted or continued	Stop work and notify SSHO					
Oxygen	Less than 19.5%	To be determined by SSHO	To be determined by SSHO	Stop work, exit area and immediately notify SSHO					
Arsenic (inorganic)	Less than action level for arsenic (inorganic) of (5 µg/m³) and/or no visible observation of excessive dusts	Level C	Periodic per plan	Continue monitoring and/or sampling and observations					
Arsenic (inorganic), continued	Greater than action level or visible observation of excessive dusts.	To be determined by SSHO	To be determined by SSHO	To be determined by SSHO					

To be determined by SSHO

To be determined by SSHO

To be determined by

SSHO

dust.

Greater than OSHA PEL or

greater than 10 mg/m³ total

Table 7 Airborne Contaminant Response Criteria							
Contaminant	Level	PPE	Monitoring Frequency	Actions Taken			
Cadmium	Less than action level for cadmium of (2.5 µg/m³) and/or no visible observation of excessive dusts	Level C	Periodic per plan	Continue monitoring and/or sampling and observations			
	Greater than action level or visible observation of excessive dusts.	To be determined by SSHO	To be determined by SSHO	To be determined by SSHO			
	Greater than OSHA PEL or greater than 10 mg/m³ total dust.	To be determined by SSHO	To be determined by SSHO	To be determined by SSHO			
Explosives Residues	Less than action level for the explosive compound having the lowest AL (DNB, 0.5 mg/m³) and/or no visible observation of excessive dusts	Level C	Periodic per plan	Continue monitoring and/or sampling and observations			
	Greater than action level or visible observation of excessive dusts.	To be determined by SSHO	To be determined by SSHO	To be determined by SSHO			
	Greater than OSHA PEL or greater than 10 mg/m³ total dust.	To be determined by SSHO	To be determined by SSHO	To be determined by SSHO			
Hydrogen Sulfide	Greater than 10 ppm	To be determined by SSHO	Periodic per plan inside of Composting Facility	Stop work, shut off equipment and evacuate Composting Facility. Notify SSHO; ventilate structure			

Table 7 Airborne Contaminant Response Criteria							
Contaminant	Level	PPE	Monitoring Frequency	Actions Taken			
Carbon Dioxide (CO₂)	Greater than 4,000 ppm	To be determined by SSHO	Periodic per plan inside of Composting Facility	Stop work, shut off equipment and evacuate Composting Facility. Notify SSHO; ventilate structure			
"% LEL	Equal to or greater than 10%.	To be determined by SSHO	To be determined by SSHO	Stop work, shut off equipment, remove ignition sources if safe to do so; notify SSHO			

## Table 8 Frequency of Physiological Monitoring for Fit and Acclimatized Workers<sup>1</sup> ADJUSTED TEMPERATURE<sup>2</sup> IMPERMEABLE ENSEMBLE 90°F After each 15 minutes of work (32.2°C) or above 87.5°-90°F After each 30 minutes of work (30.8°-32.2°C) 82.5°-87.5°F After each 60 minutes of work (28.1°-30.8°C) 77.5°-82.5°F After each 90 minutes of work (25.3°-28.1°C) 72.5°-77.5°F After each 120 minutes of work (22.5°-25.3°C)

ta adj °F = ta°F + (13 x % sunshine).

Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow.

(100 percent sunshine = no cloud cover and a sharp, distinct shadow: 0 percent sunshine = no shadows.)

Note: Reprinted from Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (1985).

<sup>&</sup>lt;sup>1</sup>For work levels of 250 kilocalories/hour.

<sup>&</sup>lt;sup>2</sup>Calculate the adjusted air temperature (ta adj) by using this equation:

Table 9
Monitoring and Sampling Requirements

1.			Monitor					Sample		
Site	Activity	VOC	Dust	Oxygen and % LEL	Perimeter (VOCs /Dust)	Noise	Heat Stress	voc	Metals	Explosives
SWMU 03/10	Excavate, screen, and load soils for Composting	У	Y	0	0	Y	O	0	Y	Y
SWMU 10/15	Excavate, screen, and load soils for Composting	Y	Υ	0	0	Y	0	0	Y	Υ
SWMU 13/14	Excavate, screen, and load soils for Composting	Y	Y	0	o	Y	0	0	Y	Y
SWMU 12/14	Excavate, screen, and load soils for Composting	Υ	Y	0	0	Y	0	0	N	Y
SWMU Sampling	Obtain soil/gw samples	<b>Y</b> ¹	N	Y¹	N	N	N	N	N	N
Constru- ction of Biore- media- tion Facility	Site preparation, construction, and install all equipment	0	Υ	0	0	Y	0	0	N	N
Start-up and	Offload and grind amendments.	. z	Υ .	N	N	· .	0	N .	N	N
Opera- tions of Biore-	Load amendment blend in windrows.     Offload contaminated	N Y	Y	N Y	N	Y	0	N	N	N
media- tion Facility	soil into windrows.  4. Turn and mix windrows.	Y	Y	Y²	N	Y	0	Y	Y	У

Y = Yes, O = Optional at discretion of SSHO, N = Not required

Note: Bioaerosol sampling campaign parameters are defined and specified in Section 7.

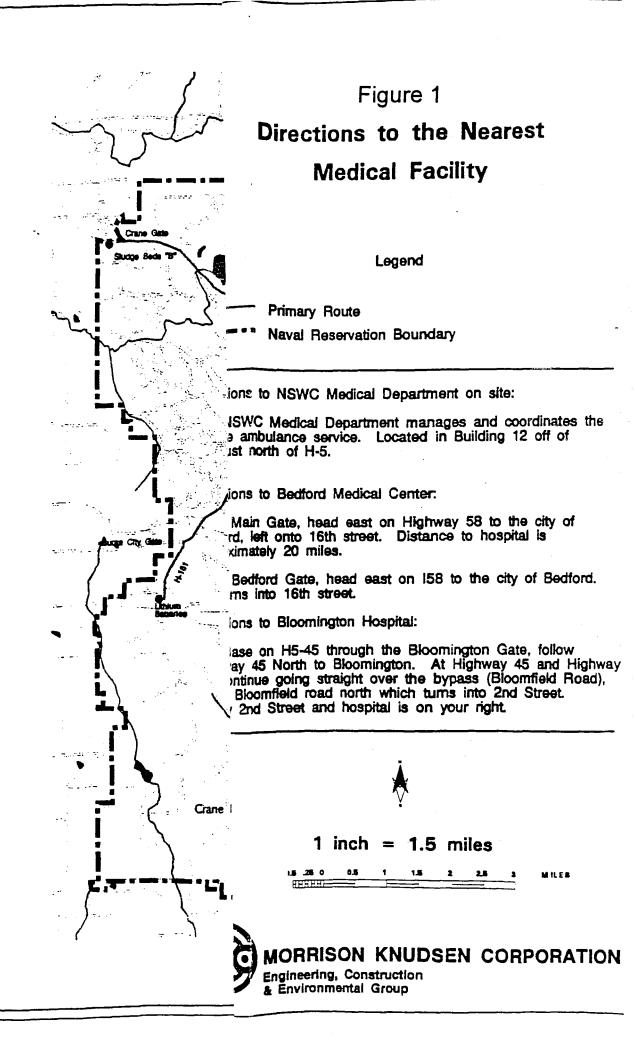
<sup>1 =</sup> When obtaining soil samples in excavations deeper than 5 feet, treat the excavation as permit-required confined space until it has been assessed by atmospheric monitoring that the atmosphere is safe and it can be downgraded to nonpermit-required confined space. Engineering controls must be in place to safeguard excavation from collapse.

<sup>&</sup>lt;sup>2</sup> = In addition to LEL and O<sub>2</sub>, conduct periodic monitoring for other organics, CO<sub>2</sub>, Hydrogen Sulfide, ammonia, oxides of nitrogen and formaldehyde levels inside of the Composting Facility using direct reading instrumentation and colorimetric indicator tubes as described in Section 7.

# **FIGURES**

# Figure 2 Safety Meeting Report

Type of Meeting:		·
Topic:		
	vere present for meeting condu	
	(date) at	
NAME	SIGNATURE	ORGANIZATION
	_	
		<u> </u>
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		. ,
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<u> </u>		
		<del></del>
inted Name of Meeting Chairman	Signature	Date



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*		

Figure 3 Pre-Entry Briefing Signature Sheet

Work area(s) to be entered		
The following personnel ha (time) on	ve had a pre-site entry briefing (date) at with this plan's provisions, and	g conducted at
(location), and are familiar requirements of this plan.	with this plan's provisions, and	are willing to meet the
NAME	SIGNATURE	ORGANIZATION
rinted Name of Supervisor	Signature	Date

### Figure 4 SSHO Daily Logbook Report

Page \_\_\_ of \_\_\_

Report Number \_\_\_\_ Date \_\_\_\_\_ Location(s) Work Activity and # Employees: \_\_\_\_\_\_ Weather: Wind speed Wind direction Temp. & Pressure Precipitation Amount sun Monitoring conducted: Sampled Location Instrument used <u>Results</u> Sampled for By/Time Levels of Protection: \_\_ Problems or Unusual Situations: Correspondence: Other Comments:

MK SSHO Printed Name:

Signature \_\_\_\_\_ Date \_\_\_\_

Figure 5 SSHP Weekly Inspection Checklist

Surveilla	nce No.	

SURVEI	LLANCE NO:	ACTIVITY:			PROJECT NO:				
DATE:	DATE: LOCATION:							SURVEYED ORGANIZATION:	
				<del></del>			PRIME:		
		SITE/AREA CONTACT	:	RESPONSIBLE MA	ANAGER:		SUBTIER:		
ITEM NO.	DESCRIPTION OF SURVE	EYED ITEMS	N/A SAT UNSAT	DESCRIPTION OF DISCREPANCY/ NON-COMPLIANCE	ACT OR COND	CAT	REQUIRED ABATEMENT DATE	CORRECTIVE ACTION TAKEN AND DATE ABATEMENT COMPLETED	
	Section 1								
1	Scope of work and site contaminants	accurately described?							
	Section 2								
2	Activity hazard analysis prepared for each major work phase? (EM 385-1-1, Section 01.A.09)								
3	All hazards including chemical/biologi adequately described?	cal and physical							
	Section 3				· · · · · ·	·			
4	Roles and responsibilities described a to-date?	nd personnel roster up-							
	Section 4				,				
5	All site personnel completed required	training?							
6	Training documented and records on	site?							
	Section 5								
7	All site personnel completed initial medial qualification?				<u></u> _	<u> </u>			
.!	Section 6								
8	PPE available and in good condition?				ļ	-	*		
9	PPE work per SSHP and/or SSHO dir			<u></u>					
10	Personnel trained in proper use, limita PPE?	ations, and inspection of	·						
11	PPE inspected per SSHP?			<u> </u>					

#### FIGURE 5. SSHP Weekly Inspection Checklist (continued)

Surveillance No.

ITEM NO.	DESCRIPTION OF SURVEYED ITEMS	N/A SAT UNSAT	DESCRIPTION OF DISCREPANCY/ NON-COMPLIANCE	ACT OR COND	CAT	REQUIRED ABATEMENT DATE	CORRECTIVE ACTION TAKEN AND DATE ABATEMENT COMPLETED
12	PPE donning/doffing procedures in place?						
13	Written SOP available describing respirator selection and use?	· <u></u>		·			
	Section 7	,					
14	Air monitoring conducted per SSHP?						
15	Monitoring equipment properly maintained and calibrated?						
16	Employees notified of monitoring results?						
17	Chain of custody prepared and maintained for all samples?		<u> </u>				<u> </u>
	Section 4 and 8			· · · · · · · · · · · · · · · · · · ·	_		
18	Weekly safety meeting held?						
19	Pre entry briefs held? and signature sheet completed?						
20	Haz Com programs in place?						
21	Competent person evaluates excavation?						
22	Personnel responsible for work maintains control of area and general safety requirements are being followed?			<u> </u>			
	Section 9		<u> </u>				
23	Work zone maps prepared and updated?						
24	Maps posted near work area and stored in field master SSHP?						
25	Traffic patterns established and rules observed?			<u></u>	<u></u>		
	Section 10		<u> </u>				
26	Inspections performed of all personnel, clothing and equipment leaving exclusion zone?						
27	All materials decontaminated prior to existing contamination reduction zone?						
28	Decon stations properly established?						
29	Proper personal hygiene practices observed?						

#### FIGURE 5. SSHP Weekly Inspection Checklist (continued)

Surveillance No. \_\_\_\_\_

ITEM NO.	DESCRIPTION OF SURVEYED ITEMS	N/A SAT UNSAT	DESCRIPTION OF DISCREPANCY/ NON-COMPLIANCE	ACT OR COND	CAT	REQUIRED ABATEMENT DATE	CORRECTIVE ACTION TAKEN AND DATE ABATEMENT COMPLETED
30	Decon solutions collected and properly disposed of?						
	Section 11		<b>-</b>				
31	At least two employees on each shift trained in CPR and first aid and BLOOD BORNE pathogens?						
32	First aid kit at each work site?						
33	All first aid and medical cases promptly reported to MK SSHO?				ļ		
	Section 12						
34	All personnel trained on Emergency Response Plan and Contingency Procedures?						
35	Emergency pre-planning addressed in safety meeting?				<u> </u>		
36	List of emergency services/contact is up to date and posted?			<u> </u>			
37	Assembly points identified and communicated to employees?	! !					
38	Evacuation routes established and communicated to employees?						
39	Communication methods are adequate			<u> </u>			
40	All drills, exercises, and emergencies critiqued?				<u> </u>	<u></u>	
41	All emergencies promptly reported to MK SSHO?	<u> </u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>
	Section 13						<del></del>
42	MK SSHO maintains project log book?						
43	Daily reports completed by MK SSHO?						
44	Daily inspections completed by MK SSHO?						
45	Weekly reports prepared by MK SSHO?			ļ <u>.</u>			
46	Records of all injuries and illnesses maintained by MK SSHO?	 					
	Section 14	,		·		<b>.</b>	
47	Work plans/Operational Plans available and up to date?	<u></u>		<u></u>	<u> </u>	L	

#### FIGURE 5. SSHP Weekly Inspection Checklist (continued)

Sun	/eillan	ce No	
Juit	v Ciliai ii	JE 11U.	

ITEM NO.	DESCRIPTION OF SURVEYED ITEMS	N/A SAT UNSAT	DESCRIPTION OF DISCREPANCY/ NON-COMPLIANCE	ACT OR COND	CAT	REQUIRED ABATEMENT DATE	CORRECTIVE ACTION TAKEN AND DATE ABATEMENT COMPLETED
48	SOPS developed as needed?						
48A	Equipment operational checklists developed as needed?						
48B	Maintenance SOPs include safety and health aspects?						
	Section 15						
49	Τwo-way radios available per SSHP?						
50	Cellular telephone available as needed?		·				
51	Emergency alarms available and personnel trained on what actions to take?						
52	Drills and exercises conducted to test communication methods?						
	Section 16					-	
53	Spill response measures reviewed with personnel?						
54	Suitable quantities of spill supplies available?						
55	Spills promptly reported to MK SSHO?	I					
56	Operations arranged to minimize spills?				<u> </u>		
	Section 17						
57	Confined space requirements of 385-1-1, Section 06.0.01 followed? Personnel trained?						

Inspection Performed By:	Date:
Abatement Accepted By:	Date:

# **APPENDIX A ACTIVITY HAZARD ANALYSIS**

ACTIVITY HAZARD ANALYSIS (AHA)								
Activity: General Soil Excavat Composting, SWMU	ion Activity and Transport for 03/10	Analyzed By/Date: Frank J. Petrik 6/26/96	Reviewed By/Date:					
1.0 Principal Steps	Potential Hazards	Recommended Controls						
<ul> <li>1.1 Walk area down, establish work zone, haul routes, get permit and begin soil excavation.</li> <li>1.2 Screen Soil, load and haul activity.</li> <li>Note: see worksheet on Screener also.</li> </ul>	<ol> <li>1.1a. Contact with underground utilities or process piping.</li> <li>1.1b. Contact with unexploded ordnance.</li> <li>1.1c. Struck by and struck against physical objects during clearing and grubbing.</li> <li>1.1d. Biological; weeds, snakes, spider's; other plant life.</li> <li>1.1e. Contact by inhalation, direct contact or ingestion of chemical contaminants.</li> <li>1.2a. Struck by and struck against physical objects during load and haul operations.</li> <li>1.2b. Spread of contaminated materials.</li> </ol>	at excavation site. Utility locate through the NSWC PWD.  1.1b. MK PM to reverify with N Survey.  1.1c. MK SSHO to lead Plan of and grubbing safety based on E 1.1d.MK SSHO to discuss speciawareness with NSWC Medica and plan for and communicate Briefs.  1.1e. Level C PPE specified. P Dust control by wetting required required.  1.2a. Preplan work layout (Wo posted). Access and Haul road 385-1-1, Section 21.1 by MK o	Day meeting reviewing clearing EM-385-1 Section 31. cific biological hazards I and/or Safety/IH department findings at POD and/or Pre Entry ersonal air sampling required. ed. Personal decontamination of the Embedding of the Emb					

ACTIVITY HAZARD ANALYSIS (AHA)					
Activity: General Soil Excavation Activity and Transport for Composting, SWMU 03/10  Analyzed By/Date: Frank J. Petrik 6/26/96  Petrik 6/26/96					
1.3 Equipment to be to 1.4 Heavy equipment to excavation and hauling	or Daily, prior to use per	OSHA 1910.120 40-Hour Tra Supervisory. 8 hour Refreshe	r, Site Safety and Health Plan		
Clearing and grubbing handtools.		(Project Kickoff), POD, Pre an Communication, Respirator.	d Post Entry Briefs, OSHA Haz		

	ACTIVITY HAZARD ANALYSIS (AHA)					
Activity: General Soil Excavation Activity and Transport for Composting, SWMU 12/14		Analyzed By/Date: Frank J. Reviewed By/Detrik 6/26/96		Reviewed By/Date:		
2.0 Principal Steps	Potential Hazards		Recommen	ded Controls		
2.0 Principal Steps  2.1 Walk area down, establish work zone, haul routes, get permit and begin soil excavation.  2.2 Screen Soil, load and haul activity. Note: see worksheet on Screener.	Potential Hazards  2.1a. Contact with underground utilities or process piping. 2.1b. Contact with unexploded ordnance. 2.1c. Struck by and struck against physical objects during clearing and grubbing. 2.1d. Biological; weeds, snakes, spiders; other plant life.  2.1e. Contact by inhalation, direct contact or ingestion of chemical contaminants.  2.2a. Struck by and struck against physical objects during load and haul.  2.2b. Spread of contaminated materials.	2.1a. 2.1b. 2.1c. 2.1d. 2.1e. 2.2a.	Excavation and Trer place at work site. MK onsite PM through the second of the second	nching Permit completed and in Utility locates coordinated by Igh the NSWC PWD. MK PE Inining of structural supports. With NSWC the necessity for Illian of Day meeting reviewing Inguity safety based on EM-385-1 In Information Section 1. In Information 1. In Inform		
		2.2b.	Emergency procedung haul trucks must be Vehicle decontamin during transport. Mecontamination and load is covered, during transport.	ation station and covered loads		

	ACTIVITY HAZARD ANALYSIS (AHA)					
Activ	ity: General Soil Excava Composting, SWML	tion Activity and Transport for I 12/14	Analyzed By/Date: Frank J. Petrik 6/26/96	Reviewed By/Date:		
2.3	Equipment to be Used	Inspection Requirements	Training I	Requirements		
2.4 Heavy equipment for excavation and hauling. Clearing and grubbing handtools.  Daily, prior to use per manufacturer's recommendation.		OSHA 1910.120 40-Hour Trai Supervisory. 8 hour Refreshe (Project Kickoff), POD, Pre and Communication, Respirator.				

ACTIVITY HAZARD ANALYSIS (AHA)				
Activity: General Soil Excavation Activity and Transport for Composting, SWMU 12/13		Analyzed By/Date: Frank J. Reviewed By/Dat Petrik 6/26/96		Reviewed By/Date:
3.0 Principal Steps	Potential Hazards		Recommen	ded Cantrols
3.1 Walk area down, establish work zone, haul routes, get permit and begin soil excavation.  3.2 Soil, load and haul activity. Note: see worksheet on Screener.	3.1a. Contact with underground utilities or process piping.  3.1b. Contact with unexploded ordnance.  3.1c. Struck by and struck against physical objects during clearing and grubbing.  3.1d. Biological; weeds, snakes, spiders; other plant life.  3.1e. Contact by inhalation, direct contact or ingestion of chemical contaminants.  3.2a. Struck by and struck against physical objects during load and haul.  3.2b. Spread of contaminated materials.	3.1a. 3.1b. 3.1c. 3.1d. 3.1e.	Excavation and Trence place at work site. Use on site PM through the assess undermining of MK PM to reverify with Survey.  MK SSHO to lead Place clearing and grubbing Section 31.  MK SSHO to discuss awareness with NSW department and plan POD and/or Pre Entry Level C PPE specified Dust control by wetting decontamination required Preplan work layout (posted). Access and against EM 385-1-1,	thing Permit completed and in tility locates coordinated by MK e NSWC PWD. MK PE must f structural supports.  th NSWC the necessity for UXO n of Day meeting reviewing safety based on EM-385-1  specific biological hazards C Medical and/or Safety/IH for and communicate findings at Briefs.  Personal air sampling required. ng required. Personal
		3.2b.	procedures and commust be established.  Vehicle decontaminat during transport. MK decontamination and load is covered, during	uck only). Emergency nunications with haul trucks  ion station and covered loads SSHO to assess PPE requirements from time g transport and off loading viewed at Pre-Entry Briefs.

	ACTIVITY HAZARD ANALYSIS (AHA)					
Activ	vity: General Soil Excavat Composting, SWMU	tion Activity and Transport for 12/13	Analyzed By/Date: Frank J. Petrik 6/26/96	Reviewed By/Date:		
3.3	Equipment to be Used	Inspection Requirements	Training F	lequirements		
3.4	Heavy equipment for excavation and hauling. Clearing and grubbing handtools.	Daily, prior to use per manufacturer's recommendation.				

ACTIVITY HAZARD ANALYSIS (AHA)					
Activity: General Soil Excavation Activity and Transport for Composting, SWMU 10/15		Analyzed By/Date: Frank J. Petrik 6/26/96		Reviewed By/Date:	
4.0 Principal Steps	Potential Hazards		Recommen	ded Controls	
4.1 Walk area down, establish work zone, haul routes, get permit and begin soil excavation.	<ul><li>4.1a. Contact with underground utilities or process piping.</li><li>4.1b. Contact with unexploded ordnance.</li></ul>	<b>4.1</b> a. <b>4.1</b> b.	place at work site. U onsite PM through the	hing Permit completed and in tility locates coordinated by MK e NSWC PWD. th NSWC the necessity for UXO	
	4.1c. Struck by and struck against physical objects during clearing and grubbing.	4.1c.	MK SSHO to lead Pla	n of Day meeting reviewing safety based on EM-385-1	
	4.1d. Biological; weeds, snakes, spiders; other plant life.  4.1e. Contact by inhalation, direct contact or ingestion of	4.1d.	awareness with NSW	specific biological hazards C Medical and/or Safety/IH for and communicate findings at Briefs.	
4.2 Soil, load and haul activity. Note: see worksheet on Screener also.	chemical contaminants.  4.2a. Struck by and struck against physical objects during load and haul.	4.1e.	Level C PPE specified Dust control by wetti decontamination requ		
	4.2b. Spread of contaminated materials.	4.2a.	posted). Access and against EM 385-1-1, Backup alarms on all headlights on (haul tr	Work Zone Map completed and Haul roads to be assessed Section 21.I by MK onsite PE. motorized heavy equipment and uck only). Emergency nunications with haul trucks	
		4.2b.	during transport. MK decontamination and load is covered, during	tion station and covered loads SSHO to assess PPE requirements from time ng transport and off loading viewed at Pre-Entry Briefs.	

	ACTIVITY HAZARD ANALYSIS (AHA)					
Activ	vity: General Soil Excavation Composting, SWMU 1	on Activity and Transport for 10/15	Analyzed By/Date: Frank J. Petrik 6/26/96	Reviewed By/Date:		
4.3	Equipment to be Used	Inspection Requirements	Training F	Requirements		
4.4	Heavy equipment for excavation and hauling. Clearing and grubbing handtools.	Daily, prior to use per manufacturer's recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, OSHA Hazard Communication, Respirator.			

·	ACTIVITY HAZARD	ANALYSIS (AHA)	
Activity: Field Sampling Activities for Soil.		Analyzed By/Date: Frank J. Petrik 6/26/96	Reviewed By/Date:
5.0. Principal Steps	Potential Hazards	Recommen	ded Controls
<ul> <li>5.1. Hand augering (in excavations)</li> <li>5.2. Hand augering (non excavated areas)</li> <li>5.3. Containerized Liquids Sampling</li> <li>5.4. Sampling Equipment Decontamination</li> </ul>	<ul> <li>5.1a. Collapse of excavation, entrance and egress, contaminated soil contact, contact with underground utility or piping/ mechanical system.</li> <li>5.2a. Contaminated soil contact, contact with utility or piping/ mechanical system.</li> <li>5.3a. Contaminated liquid contact.</li> <li>5.4a. Contact with contaminated material, also direct contact with decontamination solutions (weak nitric acid and acetone)</li> </ul>	5.1a. Sampler requires approval from competent person to enter excavation if deeper than 5 foot. Atmospheric condition in excavation checked prior to and during sampling. Modified Level D PPE expected, upgrade per SSHO review. Analyze for potential contact with any underground utility or mechanical service. Note: Excavation Permit must be valid. Review Field Sampling Kit MSDSs.  5.2a. Valid Excavation/Trenching Permit required to be in place for sampling. Analyze for potential contact with any underground utility or mechanical service. Level D PPE expected, upgrade per MK SSHO review. Review Field Sampling Kit MSDSs.  5.3a. Modified Level D PPE.	
5.5 Equipment to be Used	Inspection Requirements	Training R	equirements
5.6. Soil auger, stainless steel spoons, buckets, field sampling kits and decontamination solutions.	Per manufacturers recommendation. Core drilling equipment if used must be inspected daily. Preplan waste handling.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, OSHA Ha Communication, Respirator. DOT 181 certification for personal supervising the preparation of contaminated materials for offsite shipment.	

	ACTIVITY HAZARD	ANALYSIS (AHA)		
Activity: SWMU "temporary" Decontamination Facility Operations, Personnel and Equipment.		Analyzed By/Date: Frank J. Petrik 6/26/96	Reviewed By/Date:	
6.0. Principal Steps	Potential Hazards	Recommen	ided Controls	
6.1. Receive and place material at facility.	6.1a. Struck by and struck against. Material handling concerns.	6.1a. SWMU temporary Decontamination Facility to provide isolation and controlled access. Equipment must be secure or blocked. MK SSHO and Project Supervisor(s) to review material handling procedures to insure good practices and approved equipment is used which conforms to OSHA & EM-381 Section 28.1 requirements.		
6.2. Decontaminate Equipment using high pressure wash or hand scrubbing and/or automatic wash on vehicle tires and undercarriage.	6.2a. Contact with contaminated material and cross contamination; inhalation of airborne aerosols; contact with high pressure wash stream; unexpected movement of material to be decontaminated.	integrity of Facility's containment liners and containers used for waste waters. Personnel decontamination required including		
6.3. Rock/Debris washing	6.3a. Same as 6.1a and 6.2a.	6.3a. Same as 6.1a and 6.2a.		
6.4 Equipment to be Used	Inspection Requirements	Training R	equirements	
6.5. High pressure water wash with/without soap solution; other decontamination solutions; scrub brushes; material handling equipment and securing equipment.	Before use per manufacturers recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, OSHA Hazard Communication, and Respirator.		

ACTIVITY HAZARD ANALYSIS (AHA)					
Activity: Temporary storage and shipment of contaminated soils, liquids or debris.		Analyzed By/Date: Frank J. Reviewed By/Date: Petrik 6/26/96			
7.0. Principal Steps	Potential Hazards	Recommen	ded Controls		
7.1. Field screen to determine contamination, store in designated location.	7.1a. Contact with contaminated material during screening, loss of containment of contaminated material.	7.1a. Modified Level D PPE during initial screening of soil and liquids, upgrade per MK SSHO direction. Stockpile soil on polyethylene sheeting, surround with haybales and cover. Secure area. If roll-off containers used, inspect container for integrity and containment, secure area and cover. Liquid containers should be secure with secondary containment.			
7.2. Shipment of contaminated soils, liquids, or debris offsite for disposal.	7.2a. Contact with contaminated material during loading; loss of containment of contaminated material; and unsecured loads.	7.2a. Level D PPE during material handling, upgrade per MK SSHO direction. Inspect shipping containers for integrity and containment, comply with all DOT/EPA shipping requirements, especially labeling and placarding. Insure provisions for decontamination of any loading equipment.			
7.3 Equipment to be Used	Inspection Requirements	Training Requirements			
7.4. Polyethylene sheeting, hay bales, material handling equipment, liquid containers or roll-off containers.	Before use per manufacturers recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, OSHA Haza Communication, and DOT 181 certification for person supervising the preparation of contaminated materials for offsite shipment.			

ACTIVITY HAZARD ANALYSIS
SOILS BIOREMEDIATION FACILITY

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	ACTIVITY HAZARD ANALYSIS (AHA)				
Activ	Activity: Screener Operation		Analyzed By/Date: Frank J. Petrik 6/26/96  Reviewed By/Date:  William Purpora 7/18/16		
1.0	Principal Steps	Potential Hazards	Recommended Controls		
1.1	Walk area down, establish work zone and material flow. Position and secure Screener at worksite.	1.1a. Struck by and struck against physical objects during initial job set-up.	1.1a. Preplan work layout (Work Zone Map completed and posted).  Backup alarms on all motorized heavy equipment. Personnel shall maintain safe distance from equipment. High visibility vests for workers.		
1.2	Excavated material loaded into Screener and screen. Screened material either stockpiled or loaded directly into haul truck.	1.2a. Struck by and struck against physical objects during feed operations. Caught in and Caught by hazards.	1.2a. Preplan work layout (Work Zone Map completed and posted). Screener leveled, locked and outriggers or stabilizers in place. All machine guards in place and verified prior to operation. Backup alarms on all motorized heavy equipment. High visibility vests for workers.		
<b>1</b> 11		1.2b. Airborne contaminated dust from Screener operation.	1.2b. Engineering Controls in place on Screener to control dust. Dust controls by wetting for soil. Level C PPE.		
		1.2c. Noise and vibration.	1.2c. Sound Level Surveys to be conducted by MK SSHO.		
		1.2d. Fire/Explosion	1.2d. Diesel fueling operations conducted per manufacturers recommendation including daily inspection of equipment.		
1.3	Equipment to be Used	Inspection Requirements	Training Requirements		
1.4	Screener, Heavy equipment for loading and hauling.	Daily, prior to use per manufacturer's recommendation in accordance with Operational Plan.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, OSHA Hazard Communication, Respirator.		

	ACTIVITY HAZARD ANALYSIS (AHA)				
Activity: Grinder/ Mixer Operation		Analyzed By/Date: Frank J. Petrik 6/26/96	Reviewed By/Date: Wellen Purpor 7/18/25		
2.0 Principal Steps	Potential Hazards	Recommen	ded Controls		
2.1 Position and secure Grinder/Mixer at worksite. Load amendments and discharge material into storage bins from side discharge conveyor or directly into windrows for development.  Note: Grinder/Mixer will be PTO driven from tractor. Amendments will be loaded using center pivot loader with claw attachment.	<ul> <li>2.1a. Struck by and struck against physical objects during operation, caught in and caught by hazards.</li> <li>2.1b. Airborne nuisance biological aerosols; snakes, insects and rodents.</li> <li>2.1c. Noise and Vibration</li> <li>2.1d. Fire/Explosion</li> </ul>	Recommended Controls  2.1a. Preplan work layout. Grinder/Mixer leveled, locked and outriggers or stabilizers in place if operated from stationary position. All machine guards in place and verified prior to operation. Backup alarms on all motorized heavy equipment. High visibility vests for workers.  2.1b. Inspect amendment stockpiles. Modified Level D PPE with Du Mask.  2.1c. Sound Level Surveys conducted by MK SSHO.  2.1d. Diesel Fueling operations conducted per manufacturers recommendation including daily inspection of equipment.			
2.2 Equipment to be Used	Inspection Requirements	Training R	equirements		
2.3 Grinder/Mixer, Farm Tractor, Loader	Daily, prior to use per manufacturer's recommendation.	OSHA 1910.120 40-Hour Training, hour Refresher, Site Safety and Hear Pre and Post Entry Briefs, OSHA Hand Operator Training.			

	ACTIVITY HAZARD ANALYSIS (AHA)							
Activity: Offload contaminated soils into windrows using end discharge Dump Truck and Self-Powered Swing Discharge Conveyor.		Analyzed By/Date: Frank J. Petrik 6/6/96	Reviewed By/Date:					
3.0 Principal Steps	Potential Hazards	Recommen	ded Controls					
3.1 Position and secure discharge conveyor to Dump Truck and offload Dump Truck into conveyor for windrow development.	<ul> <li>3.1a. Struck by and struck against physical objects during operation; caught in and caught by hazards.</li> <li>3.1b. Airborne aerosols; chemical and biological.</li> <li>3.1c. Noise and vibration.</li> <li>3.1d. Fire/Explosion</li> </ul>	<ul> <li>3.1a. Preplan work layout. Insure conveyor is locked into position of Dump Truck. All machine guards in place and verified prior to operation. Backup alarms on all motorized heavy equipment. High visibility vests for workers.</li> <li>3.1b. Level C PPE. Air monitoring and sampling campaign per Section 7 of SSHP.</li> <li>3.1c. Sound Level Surveys conducted by MK SSHO.</li> <li>3.1d. Diesel Fueling operations conducted per manufacturers</li> </ul>						
3.2 Equipment to be Used Inspection Requirements		Training R	Requirements					
3.3 Dump Truck and Conveyor.	Daily, prior to use per manufacturer's recommendation.	hour Refresher, Site Safety and He	, 3 day OJT, 8 hours Supervisory. 8 alth Plan (Project Kickoff), POD, Hazard Communication, Respirator,					

	ACTIVITY HAZARD	ANALYSIS (AHA)			
Activity: Operation of Windrow M	Iachine, turn and mix Windrows	Analyzed By/Date: Frank J. Petrik 6/26/96	Reviewed By/Date: William Pingan 7/18/45		
4.0 Principal Steps	Potential Hazards	Recommen	ded Controls		
4.1 Diesel powered windrow/composter turning machine is driven into composting building to mix and reform the windrow piles.	4.1 Diesel powered windrow/composter turning machine is driven into composting building to mix and reform the windrow  4.1a. Struck by and struck against physical objects during operation; caught in and caught by hazards.		4.1a. Preplan work layout. All machine guards in place and verified prior to operation. Cab doors closed and cab ventilation system operating. High visibility vests for personnel in building when machine is operating.  3.1b. Level C PPE. Air monitoring and sampling campaign per Section 7 of SSHP.  3.1c. Sound Level Surveys conducted by MK SSHO.  3.1d. Diesel Fueling operations conducted per manufacturers recommendation including daily inspection of equipment.		
4.2 Equipment to be Used Inspection Requirements		Traininga	Requirements		
4.3 Windrow Machine	Daily, prior to use per manufacturer's recommendation.	hour Refresher, Site Safety and He	, 3 day OJT, 8 hours Supervisory. 8 alth Plan (Project Kickoff), POD, Hazard Communication, Respirator,		

	ACTIVITY HAZARÐ	ANALYSIS (AHA)		
Activity: Monitoring windrow parar sampling.	Activity: Monitoring windrow parameters and field screening/confirmation sampling.		Reviewed By/Date:	
5.0 Principal Steps	Potential Hazards	Recommen	ded Controls	
5.0 Principal Steps  5.1 Worker will monitor process parameters and obtain samples according to frequency established in Operational Plan.  5.1a. Struck by and struck against Windrow machine if worker is monitoring when machine is operating.  5.1b. Airborne aerosols and vapors/gases, both biological and chemical. Direct contact with chemicals contained in sampling kits.		<ul> <li>5.1a. Preplan work sequence, maintain clear area away from machine. Wear high visibility vest.</li> <li>5.1b. Modified Level D with Dust Mask, upgrade or downgrade based on results of air monitoring and sampling campaign. Use Level C PPE if in building at same time the Windrow machine is operating. Review MSDS and suppliers instructions for sampling kits.</li> </ul>		
5.2 Equipment to be Used	Inspection Requirements	Training A	(equirements	
5.3 Instrumentation and sampling kits.	Daily, prior to use per manufacturer's recommendation.	hour Refresher, Site Safety and Hea	, 3 day OJT, 8 hours Supervisory. 8 alth Plan (Project Kickoff), POD, Hazard Communication, Respirator.	

	ACTIVITY HAZARD ANALYSIS (AHA)								
Activity: Load and Transport Treate	ed Soils	Analyzed By/Date: Frank J.  Petrik 6/26/96  Cullin Pippom 7/18/25							
6.0 Principal Steps	Potential Hazards	Recommended Controls							
6.1. Loader will load treated soil into Dump Truck for transport to onsite landfill for use as daily cover.	6.1a. Struck by and struck against physical objects during operation.	6.1a. Preplan work layout). Haul roads to be assessed against EM 385-1-1, Section 21.I by MK onsite PE. Backup alarms on all motorized heavy equipment and headlights on (haul truck only). Emergency procedures and communications with haul trucks must be established. High visibility vests for personnel working in near vicinity of heavy equipment.							
	<ul><li>6.1.b Airborne nuisance dust.</li><li>6.1.c Noise and vibration.</li><li>6.1.d Fire/Explosion</li></ul>	<ul> <li>6.1b. Dust Controls required to include covered loads during transport. Level D PPE expected, upgrade if necessary.</li> <li>6.1c. Sound Level Surveys conducted by MK SSHO.</li> <li>6.1d. Diesel Fueling operations conducted per manufacturers recommendation including daily inspection of equipment.</li> </ul>							
6.2 Equipment to be Used	Inspection Requirements	Training Requirements							
6.3 Loader and Dump Truck.	Daily, prior to use per manufacturer's recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, OSHA Hazard Communication, Respirator.							

		ACTIVITY HAZARD	ANALYSIS (AHA)		
Activ	Activity: Decontamination Facility Operations, Personnel and Equipment.		Analyzed By/Date: Frank J. Reviewed By/Date:  Petrik 6/26/96  Wellen Purpum 7/18/25		
7.0	Principal Steps	Potential Hazards	Recommended Controls		
7.1	Receive and place material at facility.	7.1a. Struck by and struck against. Material handling concerns.	7.1a. Site Decontamination Facility to provide isolation and controll access. MK SSHO and Project Supervisor(s) to review mater handling procedures to insure good practices and approved equipment is used which conforms to OSHA and EM-381 Section 28.I requirements.		
7.2	Decontaminate Equipment using high pressure wash or hand scrubbing and/or automatic wash on vehicle tires and undercarriage.	7.2a. Contact with contaminated material and cross contamination; inhalation of airborne aerosols; contact with high pressure wash stream; unexpected movement of material to be decontaminated.	7.2a. Level C PPE with face shield, modify per MK SSHO review. Secure items to be decontaminated. Visual inspect integrity of Facility's containment liners and containers used for waste waters. Clean side area established for worker's street clothes and approved respirator storage after cleaning and sanitizing.		
		7.2b. Physical hazards associated with process equipment disassembly and dismantlement.	7.2b. Plan for decontamination to include PPE selection, energy control, material handling onsite, and waste management.		
7.3	Equipment to be Used	Inspection Requirements	Training Requirements		
7.3 Equipment to be Used  7.4 High pressure wash with soap solution; other decontamination solutions; scrub brushes; material handling equipment and securing equipment. Personal showers; wash and change facilities.		Before use per manufacturers recommendation.	OSHA 1910.120 40-Hour Training, 3 day OJT, 8 hours Supervisory. 8 hour Refresher, Site Safety and Health Plan (Project Kickoff), POD, Pre and Post Entry Briefs, OSHA Hazard Communication, and Respirator.		

	ACTIVITY HAZA	RD ANALYSIS		
Activity: Construction of Facility.		Analyzed By/Date: Frank J.  Petrik 6/26/96  William Composite 7/18/9		
8.0 Principal Steps	Potential Hazards	Recommended Controls		
8.1 Foundation work, structural, component installation, piping, instrumentation, subsystems.  Excavations and Hot Work where necessary.  8.1a. Physical hazards including material handling (struck by, struck against, pinch points, and falls), electrical energy, contact with chemicals used in component installation, combustion sources causing fires, confined spaces, noise, and mechanical energy.  8.1b. Excavations		8.1a. Level D PPE modified were necessary depending on job task per MK SSHO direction. Weekly safety meetings. MK SSHO to review MK Supervisory Safety Manual, MK Safety Manual, MK IH Manual and EM385-1-1 to plan and implement engineering, administrative and PPE controls. Required programs include but not limited to fire prevention; housekeeping; rigging and lifting; energy control; electrical safety (GFCI on all installations); full fall protection; hearing conservation; hazard communication and emergency preparedness.  8.1b. Excavation Permit required.		
	8.1c. Natural phenomenon hazards	8.1c. Components and structures braced for anticipated loading (wind, snow, earthquake, tornadic) during construction. Final construction must be to local Building Codes, NFPA Fire and Life Safety Code.  Note: all process piping and equipment must be labeled per ANSI and OSHA. This includes informational and Cautions and Warnings.		
8.3 Equipment to be Used	Inspection Requirements	Training Requirements		
8.4 Heavy equipment; welding and fastening equipment; electrical and pipe fitting equipment; material handling equipment including crane and cherry picker; manlift; handtools; and hand power equipment.  8.4 Heavy equipment; welding recommendation. GFCIs quarterly. Cranes daily.		Site Safety and Health Plan (Project Kickoff), POD, Weekly Safety Meetings and OSHA Hazard Communication (as needed)		

	ACTIVITY HAZARD ANALYSIS							
Activity: Planned Maintenance dur	ring Operations Phase of System.	Analyzed By/Date: Frank J. Petrik 6/26/96	Reviewed By/Date: Willer Purpan 7/18/91					
9.0. Principal Steps	Potential Hazards	Recommen	ded Controls					
9.1. Equipment dependent, refer to Operational Plan.	1. Equipment dependent, refer 9.1a Physical hazards, electrical and		9.1a Approved Operational Plan in place. Energy Control must be emphasized in procedures. Spare parts must meet or exceed manufacturers recommendation and intended use environment. Preplan any decontamination that may be necessary, either personal and/or equipment. Preplan waste handling and disposal.					
9.2. Equipment to be Used	Inspection Requirements	Training F	Requirements					
9.3. Per equipment vendor requirements.  Per Operational Plan. Safety Walkdown on daily basis, emergency procedures established and training		hour Refresher, Site Safety and He	, 3 day OJT, 8 hours Supervisory. 8 alth Plan (Project Kickoff), POD, a. May be modified if all clean new					

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# APPENDIX B

# **WORK ZONE MAPS**

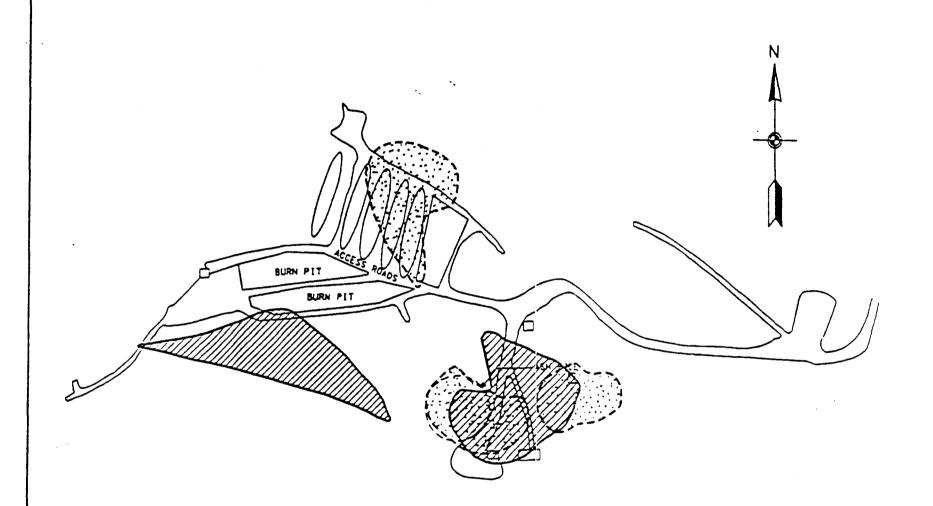
Note: Work Zone Maps will be field prepared by MK. One set of the Work Zone Maps will be inserted into the field master copy of this SSHP by the MK SSHO.

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### LEGEND

- 1. Sludge Burn Pads & Associated Tanks
- 2. Burn- Pods
- 3. Production Scrap Burn Pods
- 4. Red Phosporous Burn Pads
- 5. Primer Pit
- 6. Surface Impoundments
- 6c. Surface Impoundments tanks
- 7. Ash Inspection Pan
- 8. Incinerator Cage
- 9. PEP Contaminated Solvents Liquid Burn Pads
- 10. Contaminated Material
  Burn Pads
- 11. Primer Burn Box
- Total Explosives > 10 MG/KG

Figure 4-2a SWMU #03/10 ABG Explosives Contaminated Area, 0" to 30" Depth (ACOE. 1995)



# LEGEND

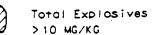
- 1. Sludge Burn Pads & Associated Tanks
- 2. Burn Pods
- 3. Production Scrap
  Burn Pads
- 4. Red Phosporous
  Burn Pods
- 5. Primer Pit
- 6. Surface Impoundments
- 6a. Surface Impoundments
- tanks
  7. Ash Inspection Pan

- 8. Incinerator Cage
  9. PEP Contaminated
  Solvents Liquid
  Burn Pads
  10. Contaminated Material
  Burn Pads
- 11. Primer Burn Box
- P8 >500 MG/KG
- CD>10 MG/KG

Figure 4-2b SWMU #03/10 ABG Metals Contaminated Area, 0" to 30" Depth (ACOE, 1995)

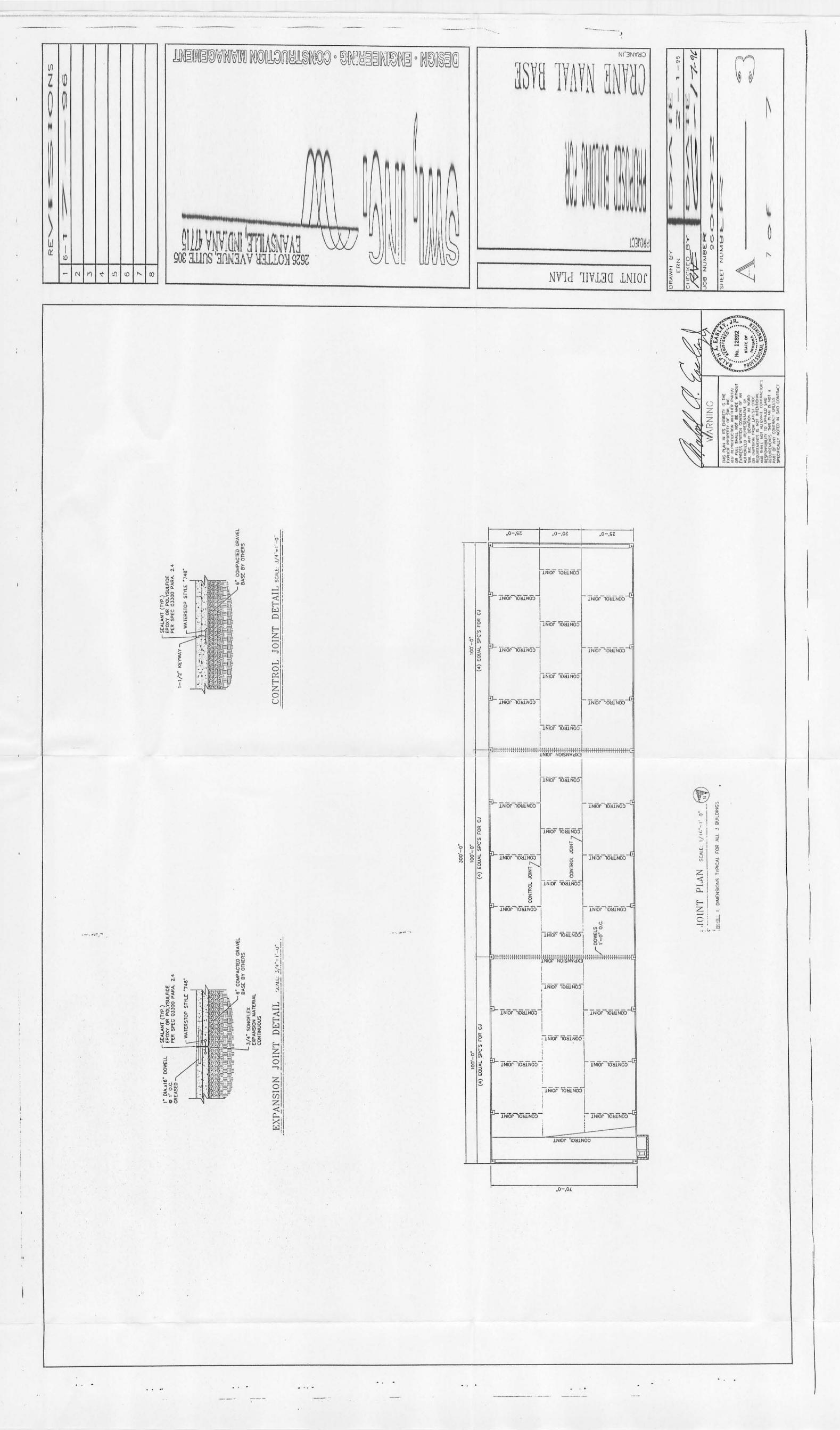
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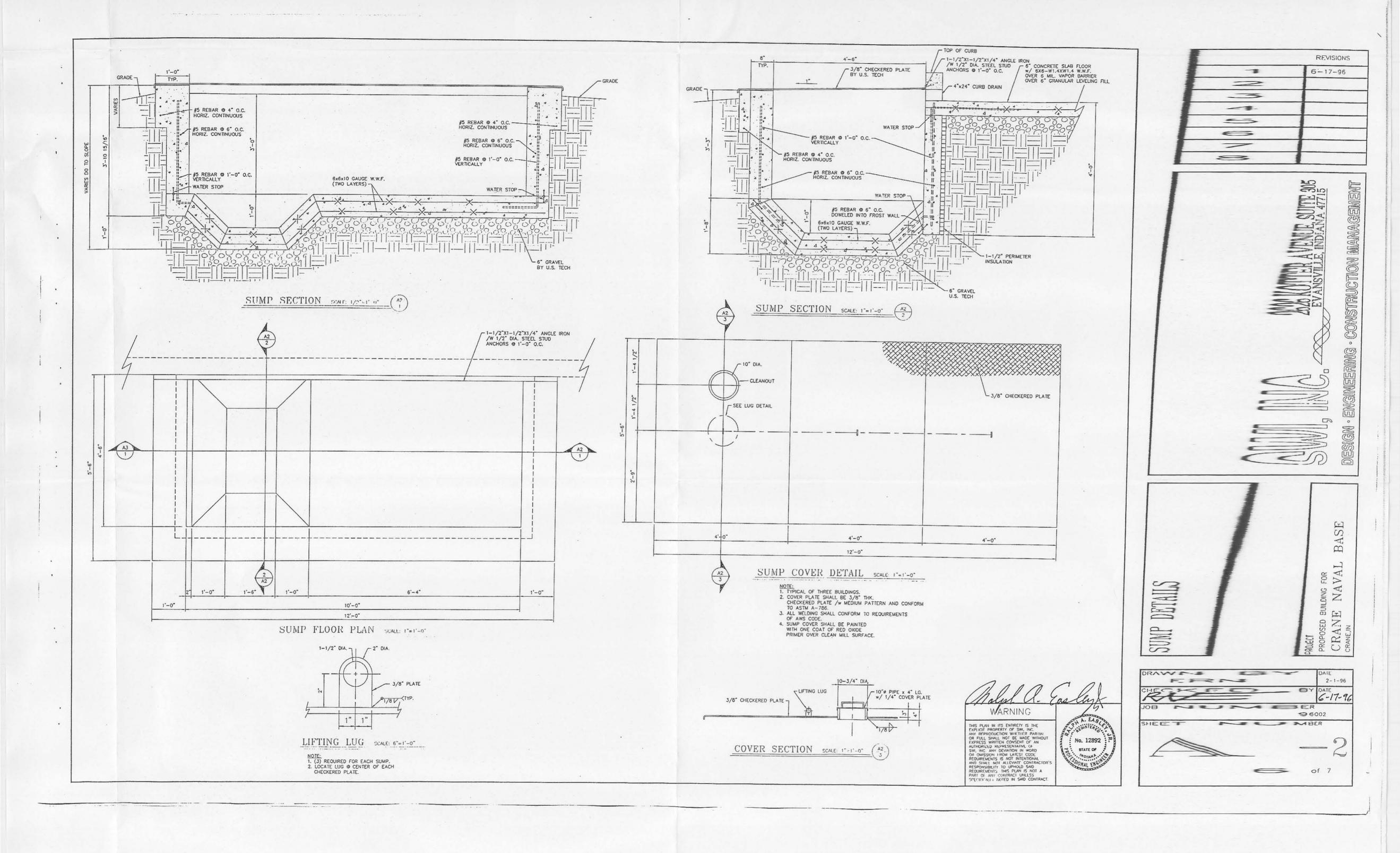
- Studge Burn Pods & Associated Tanks
- 2. Burn Pads
- 3. Production Scrap
  Burn Pads
- 4. Red Phosporous Burn Pods
- 5. Primer Pit
- 6. Surface Impoundments
- 6a. Surface Impoundments tanks
- 7. Ash Inspection Pan
- E. Incinerator Cage
- 9. PEP Contaminated Solvents Liquid Burn Pads
- 10. Contaminated Material Burn Pads
- 11. Primer Burn Box

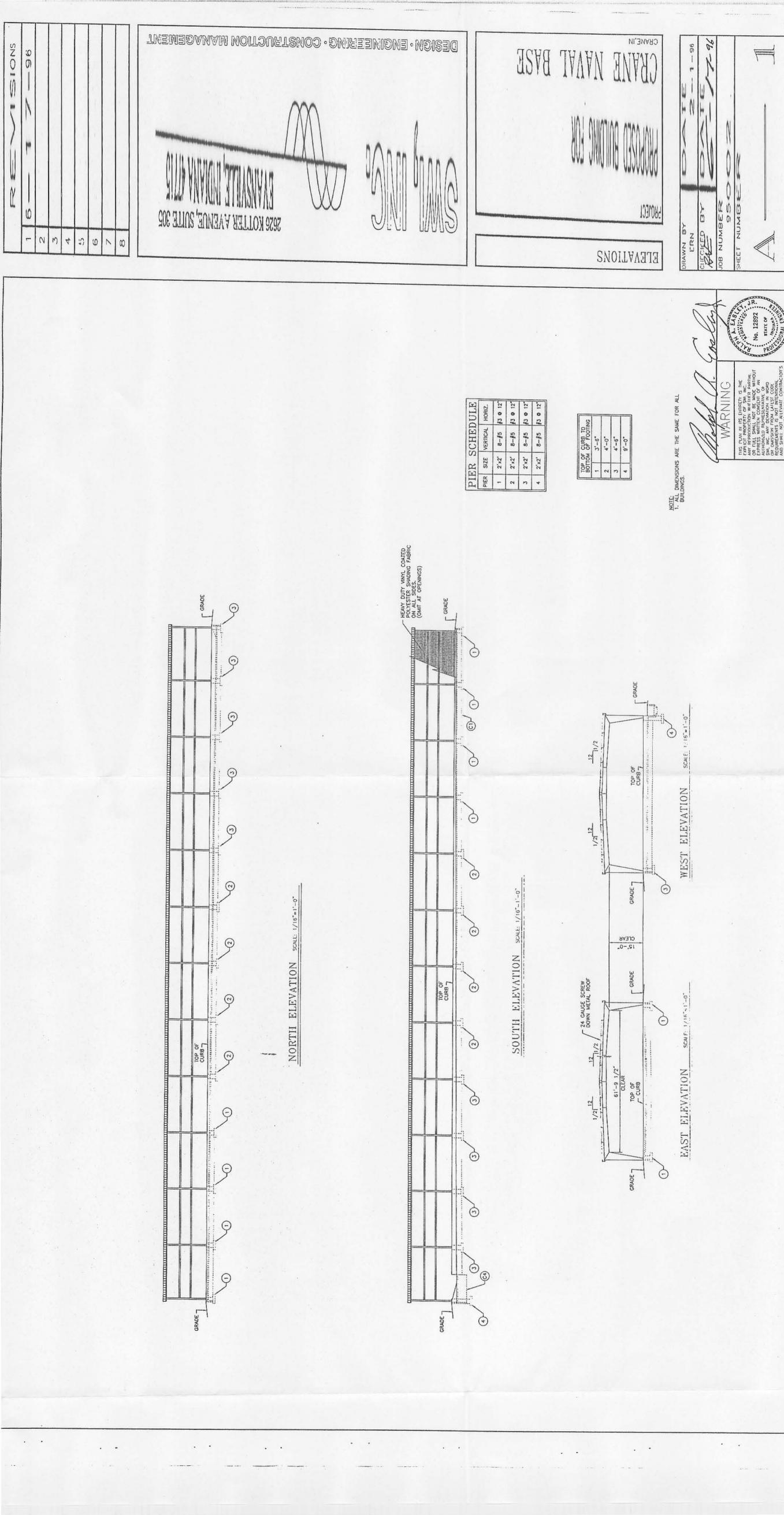


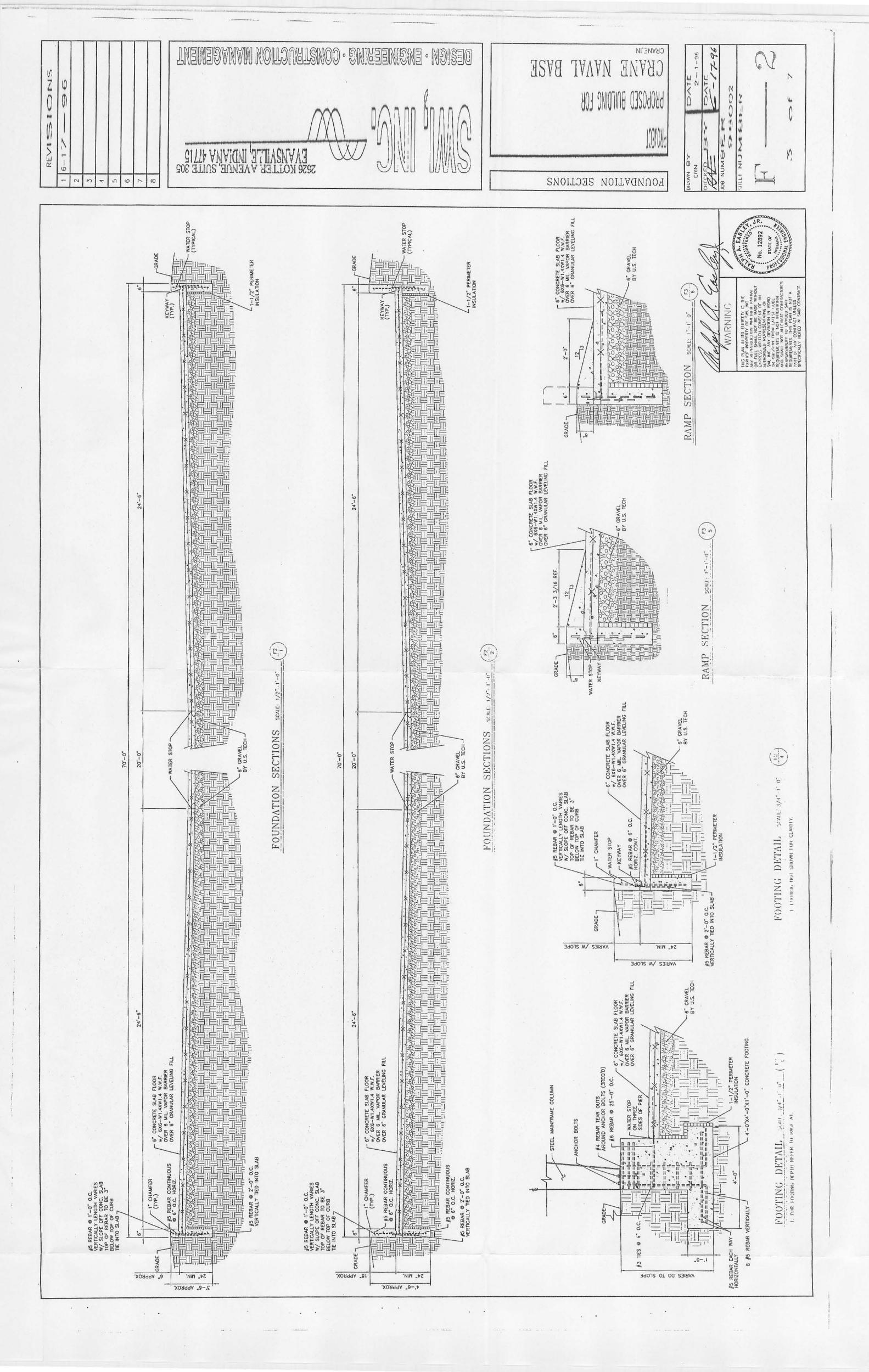
CD > 10 MG/KG PB > 500 MG/KG

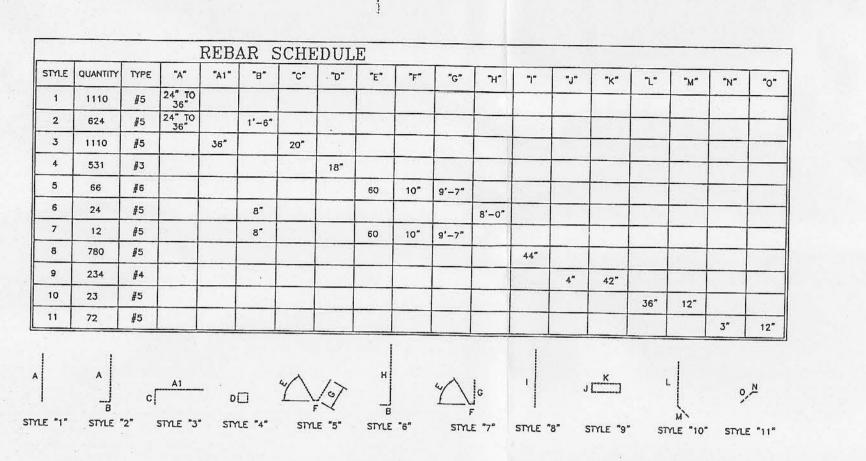
Figure 4-2c SWMU #03/10 ABG Metals and Explosives Contaminated Area, 30" to 90" Depth (ACOE, 1995)

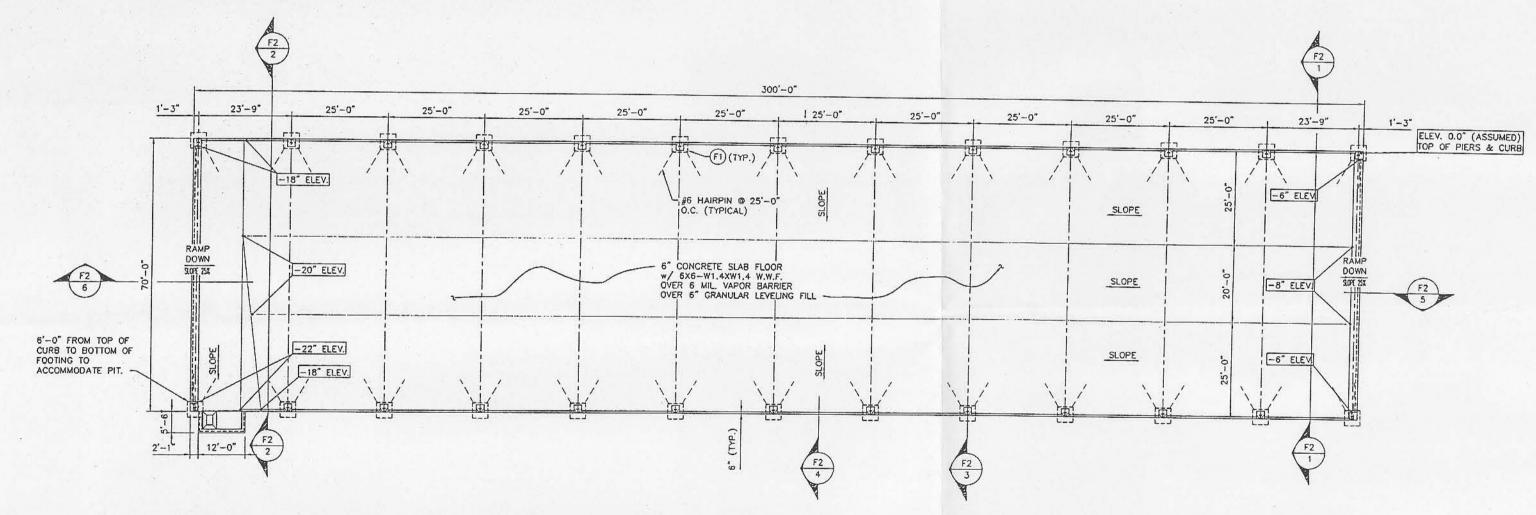












FOUNDATION I'LAN SCALE: 1/16"=1'-0"

NOTE: 1. FOOTING SIZES CALCULATED BASED ON MINIMUM SOIL BEARING CAPACITY OF 2500 P.S.F. IF SOIL BEARING CAPACITY CONDITIONS IT SS THAN 2500 P.S.F. ARE THEODITIERD HOTHLY DESIGN ENGINEER IMMEDIATELY.

2. FOR ANCHOR BOLT SIZES AND LOCATIONS SEE PRE ENGINEERED BUILDING MANUFACTURER'S ANCHOR BOLT SETTING PLAN A&S BUILDING SYSTEMS INC. (MASTER PLAN #M-190334).

3. DIMENSIONS TYPICAL FOR ALL 3 BUILDINGS.
4. SUMP IS ON HORTH SIDE FOR BUILDING #1. SUMP IS ON SOUTH SIDE OF BUILDINGS #2 & #3.
5. HIMSH SLAB TO HAVE A MIN. OF 4000 P.S.I. SLAB HAS BEEN DESIGNED TO WITH STAND A.

A. TRI -AXLE DUMP TRUCK FILLED, 70,000 POUNDS TOTAL.

FOOTING SCHEDULE

F-1 4'-0"x4'-0"x12" CONCRETE FOOTING WITH 5-#5 REBAR
EACH WAY AND 8-#5 REBAR VERTICALLY

Robel a. Es	ley
IIS PLAN IN ITS ENTIRETY IS THE PUICIT PROPERTY OF SWI, INC. IY REPRODUCTION WHI HE'R PARTIAL IY REPRODUCTION OF HE MADE WITHOUT PRESS WRITTEN CONSENT OF AN INFORMATION OF MORE REPRESENTATIVE OF WI, INC. ANY DEVIATION IN WORD ROMESTON FROM LATEST CODE COUREMENTS IS NOT INTENTIONAL ID STALL NOT ALLEVALTE CONTRACTOR'S SPONSIBILITY TO UPHOLD SAID COUREMENTS. THIS PLAN IS NOT A GRET OF ANY CONTRACT UNLESS ECCIFICALLY NOTED IN SAID CONTRACT	No. 12892 STATE OF MOIANA

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TYPICAL FOR 3 PANELS -

		e 10	PANE	L NO. L	P-A		120/240	VOLTS
CKT NO.	DESCRIPTION	CB AMPS	A	В	CB AMPS	DE	SCRIPTION	CKT NO.
1	* * * * * * * * * * * * * * * * * * *		1	1	00	ADEA LIQUEINO		2
3	AREA LIGHTING	20	<u> </u>	+	20	AREA LIGHTING	# # # # # # # # # # # # # # # # # # # #	4
5	2 7 7 7	00		+1	20	ADEA LICHTIMO		6
7	AREA LIGHTING	20		+	20	AREA LIGHTING		8
9		00	1	$+\uparrow$	20	SPARE		10
11	SPARE	20	1	-	. 20	OJ AILL		12
13	W. C.	20		$+ \uparrow$	20	SPARE		14
15	SPARE	20		<b>→</b> △	20	SPARE		16
17			1	+1	20	COADE		18
19	SPARE -	20	1	+	20	SPARE		20
21	RECEPTACLES	20	-	$+ \smallfrown$	20	LIGHTING CONTACTOR		22
23	EYEWASH RECEPTACLE	- 20		+	20	SPARE		24
					1010		100 10 11	
	FEEDER EN		400		AINS	T DUG 1004	ISC = 10 KA  ENCLOSURE NEMA 3R	
			100		JGS:	BUS: 100A		COTI
	BOTTOM C	_ NE	UTRAL	XI, IN	SULAILUL	I, TOP□, BOT 🖾	MTG FLUSH SURF	لفا

PANELBOARD TO BE 120/240V, 10, 3 WIRE WITH 100 AMP, 2 POLE MAIN BREAKER, 10-2 POLE 20 AMP BREAKERS & 4-1 POLE 20 AMP BREAKERS, NEMA 3R, WITH SOLID NEUTRAL, 100 AMP MAIN BREAKER SHALL BE FULLY RATED.

			Р	ANEL NO. F	PB		120/240	VOLT
CKT NO.	DESCRIPTION		CB AMPS	A B	CB AMPS	D	ESCRIPTION	CK
1			70	1				2
3	PRESSURE WASH. UNIT		30	++^	70	HOT WATER HEATER		4
5	BATH LIGHT & VENT		20	44~	20	FLUORESCENT LIGHT	(STORAGE)	6
7	RECEPTACLES		20	+	20	BATHROOM RECEPTAC	CLES	8
9	CDADE		20	++1	00	HEAT PUMP RECEPTA	CLE	10
11	SPARE		20	4	20	(SEE NOTE 1)		12
13	CDADE		20	++~	00	20105		14
15	SPARE		نم الا	++-	20	SPARE		
17	00405		20 1	++^{		enue	:	18
19	SPARE .		20	++	20	SPARE -		20
21	SPARE .		20	4	20	FLOODLIGHTS ( COVE	RED AREA )	22
23	OUTSIDE LIGHTS		20	4	20	SPARE		24
	CC	EDER ENTRY		MA	INS		ISC = 10 KA	200
750030		OP []	BKR: 100		Control of the Contro	BUS: 100A	ENCLOSURE NEMA 3R	

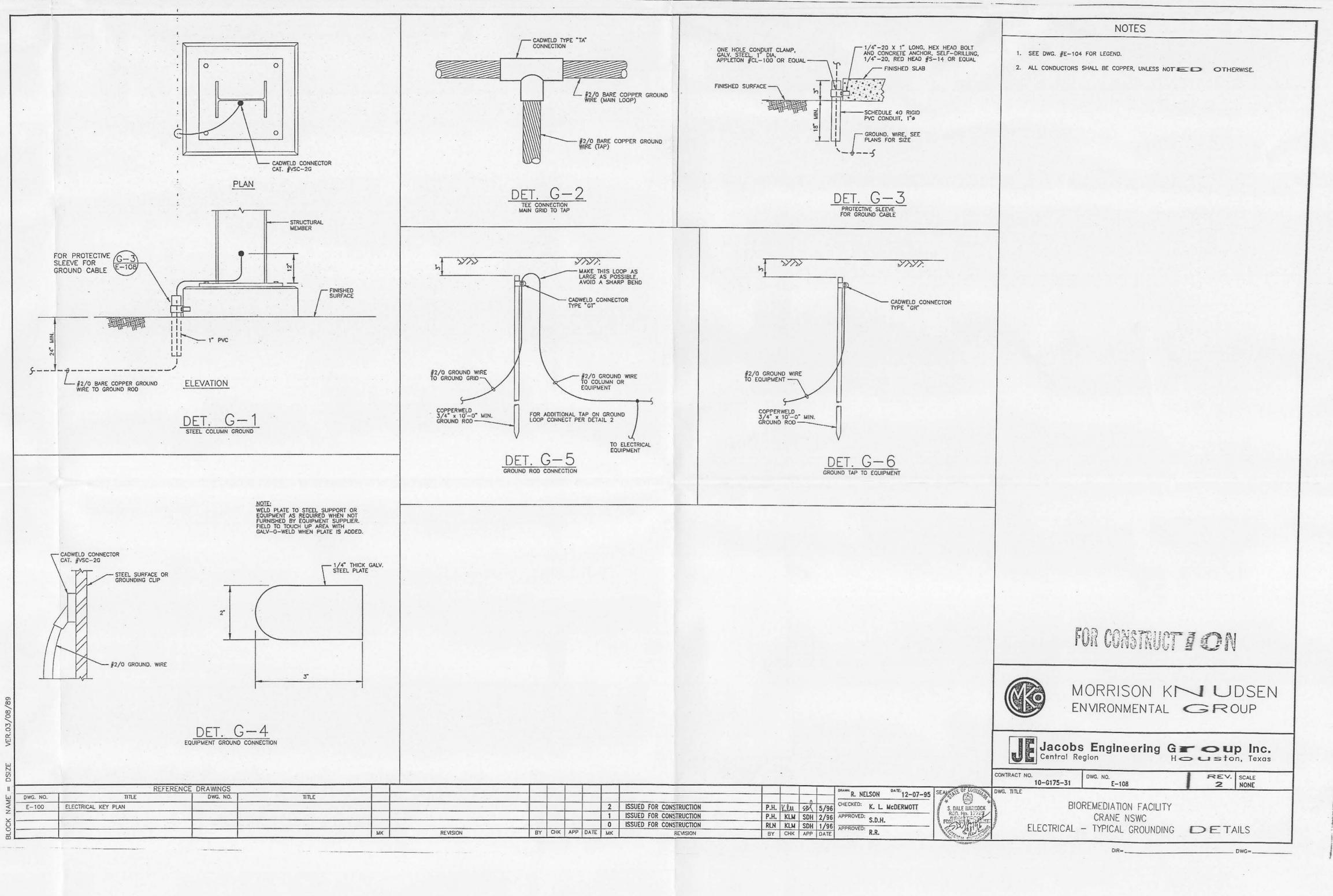
PANELBOARD TO BE 120/240V, 10, 3 WIRE WITH 225 AMP, 2 POLE MAIN BREAKER, 5-2 POLE 20 AMP BREAKERS & 8-1 POLE 20 AMP BREAKERS & 1-2 POLE 70 AMP BREAKER, 1-2 POLE 30 AMP BREAKER & 1-2 POLE 20 AMP GF| BREAKER, NEMA 3R, WITH SOLID NEUTRAL, 225 AMP MAIN BREAKER SHALL BE FULLY RATED

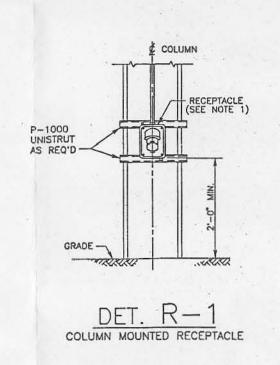
			PANEL N	120/240 VOLTS				
CKT NO.	DESCRIPTION	CB AMPS	A E	3	CB AMPS		DESCRIPTION	CKT NO.
1	FEED TO SHOWER TRAILER	100	7	<u>-</u>	100	PPB		2
3	FEED TO SHOWER TRAILER	100			100	PPB		4
5	FEED TO LAD TRAILED	100	7.	-1	100	FFED TO TOUR FD		6
7	FEED TO LAB TRAILER	100			100	FEED TO TRAILER #	2	8
9	FEED TO TRAILED #4	100	1	<b>←</b>	20	EEED TO FLOODLIGHT	re	10
11	FEED TO TRAILER #1	100	<u> </u>	$\rightarrow$	20	FEED TO FLOODLIGH	12	
13	FEED TO FLOODLIGHT CONTROL	20	$\sim$	-	100	EEED TO COMED IN	14	
15	SPARE	20	1	$\leftarrow$	100	FEED TO SEWER LIF	1 STATION	16
17	SPARE	20		$\sim$	20	SPARE	18	
19	SPARE	20	1		20	SPARE		20
21	SPARE	20	1	-~[	20	SPARE		22
23	SPARE	20	$\sim$		20	SPARE		24
	FEEDER	FNTRY I		MAI	NS		ISC = 65 KA (BRANCH BE	REAKERS)
	TOP	☐ BKR:	600A	LUC	1000	BUS: 600A	ENCLOSURE NEMA 3R	
	ВОТТОМ	N X NE	UTRAL 🖾 ,	INSU	JLATED 🗆	, TOP . BOT X	MTG FLUSH□ SUR	F (X)

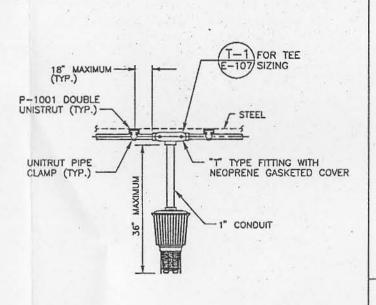
PANELBOARD TO BE 120/240V, 1Ø, 3 WIRE WITH 600 AMP, 2 POLE MAIN BREAKER, 5-2 POLE 100 AMP BREAKERS, 10-1 POLE 20 AMP BREAKERS, 1-2 POLE 20 AMP BREAKER & 1-2 POLE 100 AMP BREAKER WITH SOLID NEUTRAL BAR, 100 AMP BRANCH BREAKERS SHALL HAVE 65 KA INTERRUPTING RATING, TYPE FD, 20 AMP BRANCH BREAKERS SHALL HAVE 65 INTERRUPTING RATING, TYPE GB & 600 AMP MAIN BREAKER SHALL HAVE 200 KA INTERRUPTING RATING, TYPE CLOC (FULLY PATED) NEVA 3R

					KAIII	ic, Tipe	CLUC (FU	LLT N	KAILU,	), NEMA JR.							
*	72																
			14 H														
			4														
REFERE	ENCE DRAWINGS								T					T	T	DRAWN: D NELSON	DATE: 12-20-9
		TITL	E													2007 1 PERCENTINA	
Tarana San										2	ISSUED FOR CONSTRUCTION	P.H.	Klm	SIL	5/96	CHECKED: K. L.	McDERMOTT
CECUTIONE RELITERATION					The same of the sa					1	ISSUED FOR CONSTRUCTION	P.H.	KLM	SDH	2/96	APPROVED: S.D.U	
			10 11 111									RLN	KLM	SDH	1/96	10000VED:	•
		<del> </del>	and the second	MK	REVISION	BY	CHK	APP DAT	EN	мк	REVISION	8Y	CHK	APP	DATE	R.R.	
	REFERI TITLE ELECTRICAL KEY PLAN	The state of the s	TITLE DWG, NO. TITL	TITLE DWG, NO. TITLE	TITLE DWG, NO. TITLE	TITLE DWG, NO. TITLE	TITLE DWG, NO. TITLE  ELECTRICAL KEY PLAN	TITLE DWG, NO. TITLE	TITLE DWG, NO. TITLE	TITLE DWG, NO. TITLE	TITLE	TITLE DWG, NO. TITLE 2 ISSUED FOR CONSTRUCTION 2 ISSUED FOR CONSTRUCTION 1 ISSUED FOR CONSTRUCTION 0 ISSUED FOR CONSTRUCTION 0 ISSUED FOR CONSTRUCTION	TITLE DWG, NO. TITLE DWG, NO. TITLE 2 ISSUED FOR CONSTRUCTION P.H.  ELECTRICAL KEY PLAN 2 ISSUED FOR CONSTRUCTION P.H.  1 ISSUED FOR CONSTRUCTION P.H.	TITLE DWG, NO. TITLE 2 ISSUED FOR CONSTRUCTION P.H. KLM ELECTRICAL KEY PLAN 2 ISSUED FOR CONSTRUCTION P.H. KLM 1 ISSUED FOR CONSTRUCTION P.H. KLM	TITLE DWG, NO. TITLE DWG, NO. TITLE 2 ISSUED FOR CONSTRUCTION P.H. KLW 50X 1 ISSUED FOR CONSTRUCTION P.H. KLW 50X	TITLE   DWG, NO.   TITLE	TITLE   DWG, NO.   TITLE

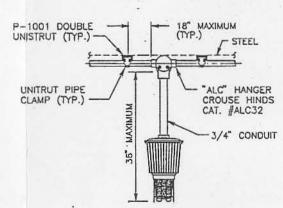
NOTES	
1. CIRCUIT BREAKER FOR FEED TO POWER WASHER GROUND FAULT INTERRUPTING TYPE.  2. ELECTRICAL SUB—CONTRACTOR SHALL LABEL MAIN DISCONNECT."	TALL BE  ERS AS "SER ICE
<ol> <li>SEE DWG. #E-104 FOR LEGEND,</li> <li>ALL CONDUCTORS SHALL BE COPPER, UNLESS NO</li> </ol>	I ERWISE.
PAR ABURTOURT	
MORRISON K	DSE
MORRISON KENVIRONMENTAL	OUP OUP
Jacobs Engineering Central Region	Ton, Texa
The state of the s	
DWG. NO. E-109	SCALE NONE
BIOREMEDIATION FACILITY	
CRANE NSWC	



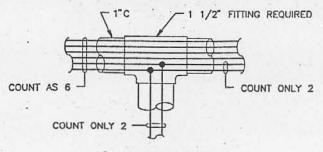








FLEXIBLE PENDANT MOUNTED LIGHT FIXTURE



EXAMPLE #1

TABLE

19 THRU 37 #10 2 1/2" 94

AWG

"T" FITTING

1 1/2"

CU. IN.

14.5

26

45

14.5

26

CONTACTOR WITH HAND-OFF-AUTO

COUNT

2 THRU 4

5 OR 6 #12

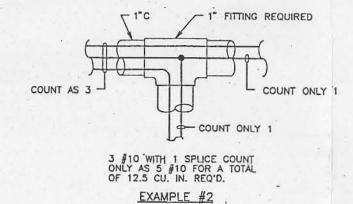
7 THRU 11 #12

12 THRU 20 #12

2 THRU 5 #10

6 THRU 10 #10

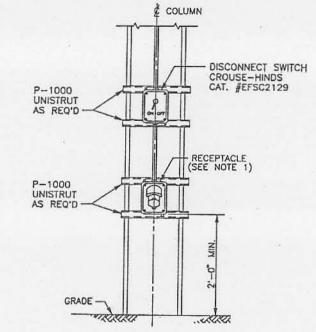
11 THRU 18 #10



### DETAIL "T-1" NOTES

- EACH CONDUCTOR THAT TERMINATES OR SPLICES IN FITTING COUNT AS ONE (1), EACH CONDUCTOR THAT PASSES THROUGH COUNT AS ONE (1).
- 2. SPLICES ALLOWED IN "T" FITTING ONLY.
- 3. FIELD TO VERIFY "T" FITTING SIZE IF REQUIRED USING ABOVE TABLE.
- 4. "T" FITTING SIZES SHOWN IN TABLE ARE BASED ON CROUSE—HINDS FORM 7 "T" FITTINGS.
- 5. VOLUME REQUIRED PER CONDUCTOR IS BASED ON 1996 N.E.C., TABLE 370-16(b).
- 6. FIELD TO INSTALL CORRECTLY SIZED REDUCERS WHERE REQUIRED TO INSURE PROPER TRANSITION FROM "T" FITTING TO CONDUIT.

EXAMPLES TO DETERMINE "T" FITTING SIZE



COLUMN MOUNTED RECEPTACLE FOR EYE WASH STATION

LIGHT FIXTURE (TYP. FOR 9)

# FOR CONSTRUCTION

NOTES

2. MATERIAL REQUIRED FOR DETAILS SHOWN ON THIS DRAWING ARE SPECIFIED ON THE LIST OF ELECTR MATERIAL FOR THE RESPECTIVE ELECTRICAL LAYOURANINGS.

INSTALL COMBINATION BREATHER/DRAIN FITTING AT LOWEST POINT IN ALL CONDUIT RUNS.

4. SEE DWG. #E-104 FOR LEGEND.

FIXTURE AND RECEPTACLES ARE INDICATED IN DE TO SHOW MOUNTINGS ONLY. SIZE AND TYPE AR SECIFIED ON RESPECTIVE ELECTRICAL LAYOUT DRAWINGS.

5. ALL CONDUCTORS SHALL BE COPPER, UNLESS NO TEL OTHERWISE.



MORRISON K WUDSEN ENVIRONMENTAL

GROUP

Jacobs Engineering Coup Inc.
Central Region Couston, Texas

10-G175-31

CRANE NSWC
ELECTRICAL - SCHEMATICS & LIGHTI C DETAILS

LIGHT FIXTURE (TYP. FOR 2) LIGHT FIXTURE (TYP. FOR 2) CON POWER PANEL DP 13/ NEUTRAL GROUND

WIRING DIAGRAM #1

WIRING DIAGRAM #2

LIGHTING PANEL LP-A

NEUTRAL GROUND

															,,		
_	RE	FERENCE DRAWINGS									T			_		DRAWN	DATE
NO.	TITLE	DWG. NO.	TITLE											-		R. NELSON	DATE
00	ELECTRICAL KEY PLAN								D	2	. ISSUED FOR CONSTRUCTION	P.H.	Klin	444	5/96	CHECKED: K. L.	McDi
		*								.1	ISSUED FOR CONSTRUCTION			SDH		APPROVED:	
										0	ISSUED FOR CONSTRUCTION	RLN			1 100	S.D.H.	
				MK	REVISION	BY	СНК	APP	DATE	МК	REVISION			APP		APPROVED: R.R.	

CHECKED: K. L. McDERMOTT

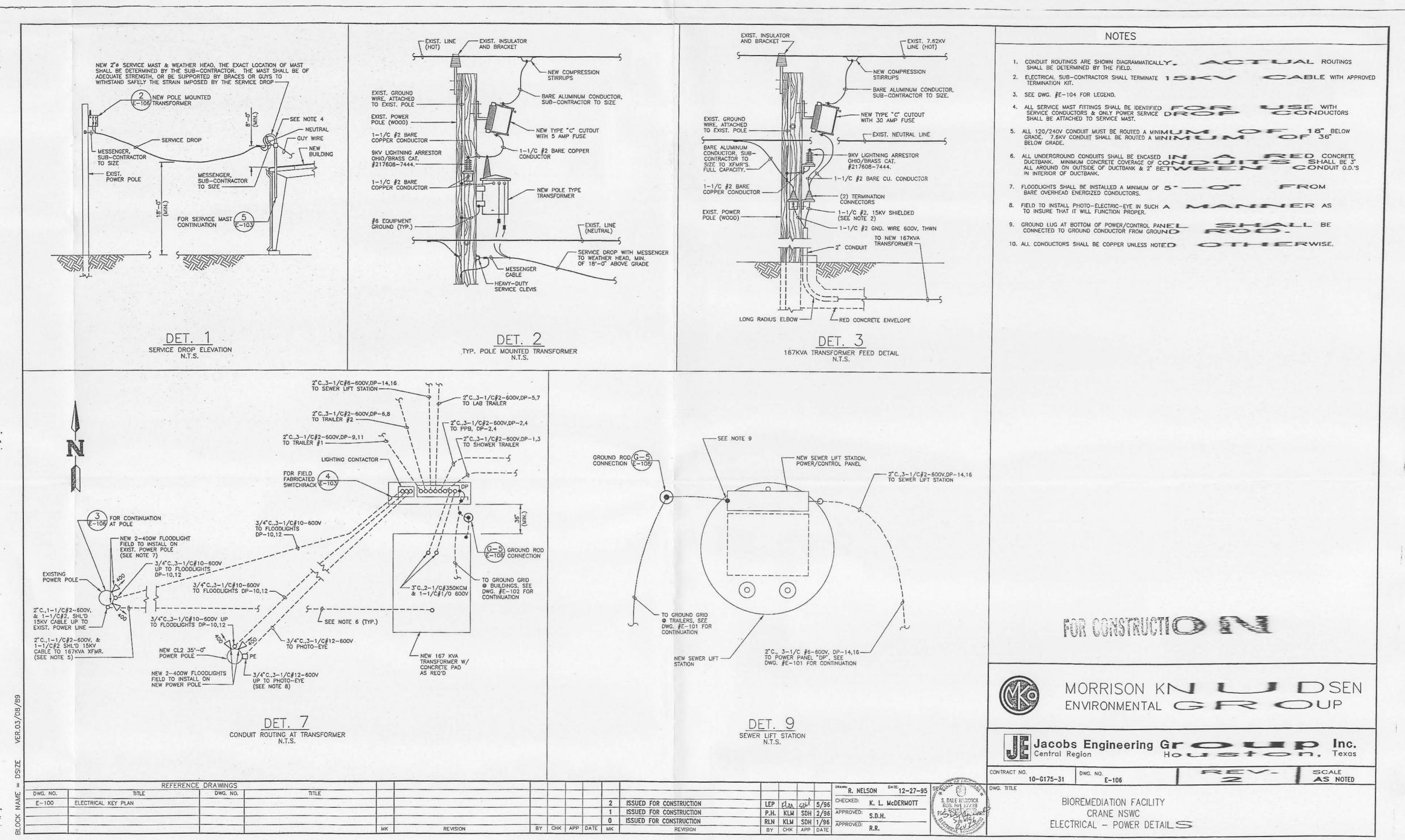
APPROVED: S.D.H.

APPROVED: R.R. CHECKED: K. L. McDERMOTT

DET. F-2

REV. SCALE NONE

BIOREMEDIATION FACILITY

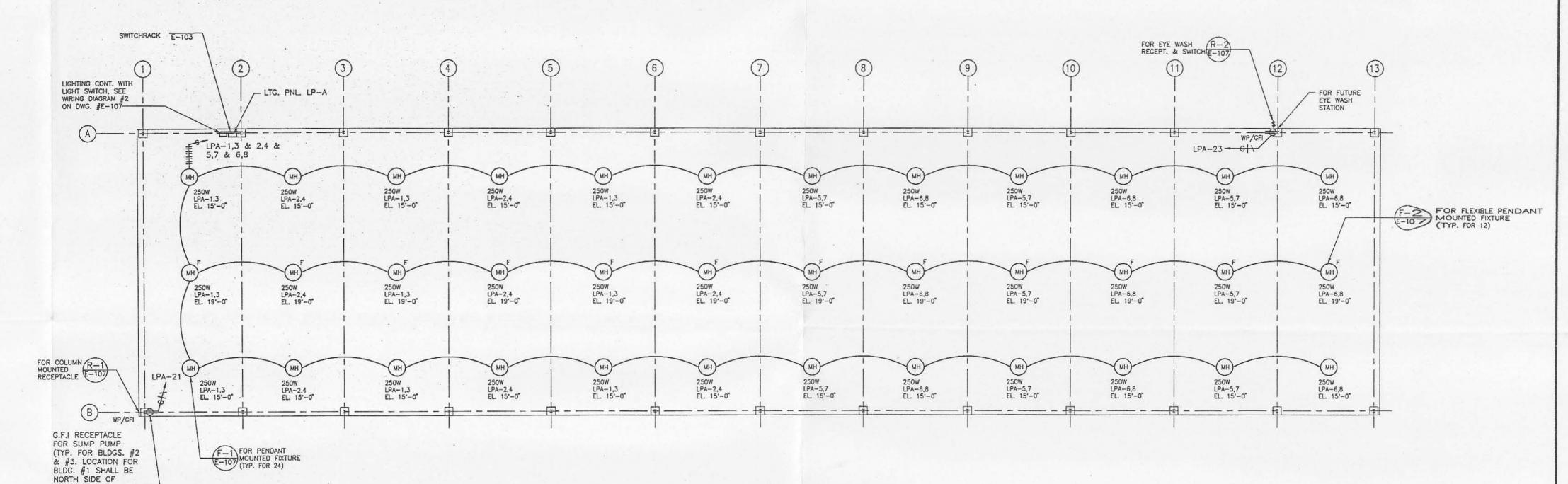


DWG=\_\_\_\_\_

FOR BUILDING 5

# NOTES:

- 1. FIELD TO INSTALL & SUPPORT CONDUIT AS REQ'D.
- 2. ALL CONDUCTORS SHALL BE #12 AWG, 600V. WITH THWN INSULATION UNLESS OTHERWISE NOTED .
- 3. CONDUIT RUNS FOR LIGHTING SHALL BE RIGID GALVANIZED
  STEEL FOR FIXTURE SUPPORT. ELECTRICAL SUB-CONTRACTOR
  MAY SUBSTITUTE EMT CONDUIT FOR RGS IN OTHER INSTANCES WHERE CONDUIT WILL NOT BE SUBJECTED TO SEVERE PHYSICAL DAMAGE, PROTECTED FROM CORROSION SOLELY BY ENAMEL, IN CINDER CONCRETE OR IN ANY HAZARDOUS (CLASSIFIED) LOCATION.
- SEE DETAIL T-1 ON DWG. #E-107 FOR SIZING OF TEE FITTINGS.
- 5. SUB-CONTRACTOR SHALL INSTALL DRAINS AT LOW POINT OF CONDUIT RUNS.
- 6. ELECTRICAL SUB-CONTRACTOR SHALL VERIFY SIZE OF CIRCUIT BREAKER & WIRE AS ADEQUATE FOR SUMP PUMP.
- 7. SEE DWG. #E-104 FOR LEGEND.
- 8. ALL CONDUCTORS SHALL BE COPPER, UNLESS NOTED OTHERWISE.



LIGHTING PLAN (TYPICAL FOR BUILDINGS #1, #2 & #3) FOR CONSTRUCTION



MORRISON K NUDSEN ENVIRONMENTAL GROUP



Jacobs Engineering Group Inc.
Central Region Houston, Texas

REV. SCALE 2 3/32 =1'-O" 0. 10-G175-31 DWG. NO. E-105

BIOREMEDIATION FACILITY CRANE NSWC ELECTRICAL - TYP. LIGHTING FOR BLDG S. #1, #2 & #3

REFERENCE DRAWINGS R. NELSON DATE: 12-07-95 P.H. KLM SDH 2/96
RLN KLM SDH 1/96
BY CHK APP DATE

R. RELSON 12-07
CHECKED: K. L. McDERMOTT

APPROVED: S.D.H.

APPROVED: R.R. DWG. NO. TITLE ISSUED FOR CONSTRUCTION ELECTRICAL KEY PLAN E-100 1 ISSUED FOR CONSTRUCTION 0 ISSUED FOR CONSTRUCTION BY CHK APP DATE MK REVISION

\_\_ DWG=\_\_\_

COLUMN A-1.) -

		FIXTURE SCHEDULE	
TYPE	QTY.	DESCRIPTION	
X	2	LIGHTING FIXTURE, 200 WATT, INCANDESCENT, 120V, W/ GUARD, CEILING MOUNT W/ GLOBE & GUARD	
MH	72	LIGHTING FIXTURE, 250 WATT, METAL HALIDE, 240V, W/ GUARD, ENCLOSED & GASKETED, SUITABLE FOR WET LOCATIONS, NEMA 4X, HAZLUX 2 CAT. #VH025C040-TGL-P3	
$\bigcirc$ <sub>F</sub>	36	LIGHTING FIXTURE, 250 WATT, METAL HALIDE, 240V, ENCLOSED & GASKETED, SUITABLE FOR WET LOCATIONS, NEMA 4X, HAZLUX 2 CAT. #VH025C040-TGL-F2	
	2	LIGHTING FIXTURE, 40 WATT, FLUORESCENT, 120V, 4"-0" LONG, 2 BULB, WITH DIFFUSER COVER WITH EMERGENCY PACK, EMERGI-LITE CAT. #FPSI	
WP/GFI	5	GROUND FAULT RECEPTACLE, 20A, 125V, SUITABLE FOR WET LOCATIONS, 2 POLE, 3 WIRE, HUBBELL CAT. #GF5352 MOUNTED IN FS SINGLE GANG BOX WITH WEATHER PROOF COVER HUBBELL CAT. #WPFS26	
(HEAT PUMP)	1	RECEPTACLE, 20A, 250V, 2 POLE, 3 WIRE. HUBBELL CAT. #5462 MOUNTED IN SINGLE GANG BOX (SEE NOTE 2)	
√ 400	4	FLOOD LIGHTING FIXTURE, 400 WATT, METAL HALIDE, 240V ENCLOSED & GASKETED, SUITABLE FOR WET LOCATIONS, HAZLUX CAT. #FH-671H-4MT WITH WOOD POLE MOUNTING BRACKET	
√175	6	FLOOD LIGHTING FIXTURE, 175 WATT, METAL HALIDE, 120V ENCLOSED & GASKETED, SUITABLE FOR WET LOCATIONS, HAZLUX CAT. #FH-371H-4MT (UL595 MARINE LISTED) WITH CLAMP MTG. BRACKET FSB-3	
GFI ⊕	4	GROUND FAULT INTERRUPT RECEPTACLE 125V-20A (INDOOR) HUBBELL CAT. #GF5352	
\$	2	LIGHT SWITCH, HUBBELL CAT. #1221-I W/ WALL PLATE CAT. #PI	
wp\$\$	1	CROUSE—HINDS CAT. #EDSC TYPE BOX WITH A TWO POSITION SELECTOR SWITCH, ROCKER ARM, CROUSE—HINDS CAT. #DSD933 AND A 3 POSTION SELECTOR SWITCH, HOA SWITCH, CROUSE—HINDS CAT. #DSD926	

. BILL OF MATERIALS					
ITEM NO.	QTY.	DESCRIPTION	VENDOR/CAT. NO.		
1	3	25 KVA POLE MOUNTED TRANSFORMER, SINGLE Ø 7620 PRI./120-240V SEC. WITH 2 PRI. BUSHINGS.	VANTRAN		
2	1	157 KVA PAD MOUNTED TRANSFORMER, SINGLE Ø 7620 PRI./120-240V SEC. WITH INTERNAL FUSING, LOOP FEED, DEAD FRONT, & MULTI TAPS 2 @ 2 1/2% INTERVALS ABOVE & 2 @ 2 1/2% INTERVALS BELOW PRIMARY VOLTAGE.	VANTRAN		
3	20	COPPER CLAD GROUND ROD 8'-0" LONG x 3/4" DIA.	AMERICAN ELECTRIC-BLACKBURN CAT. #7508		
4	3	LIGHTING PANEL "LPA" - 24 CKT. 100 AMP MAIN BREAKER	CUTLER HAMMER/WESTINGHOUSE POW-R-LINE 1, NEMA 3R PANEL BOARD SEE DWG. #E-109 FOR REQUIREMENTS		
5	1	POWER PANEL "PPB" - 24 CKT. 100 AMP MAIN BREAKER	CUTLER HAMMER/WESTINGHOUSE POW-R-LINE 1, NEMA 3R PANEL BOARD SEE DWG. #E-109 FOR REQUIREMENTS		
6	1	POWER DISTRIBUTION PANEL "DP" - 28(X) SPACE 600 AMP MAIN BREAKER	CUTLER HAMMER/WESTINGHOUSE POW-R-LINE 4-NEMA 3R PANEL BOARD SEE DWG. #E-109 FOR REQUIREMENTS		
7	4	HIGH VOLTAGE TYPE "C" CUT-OUTS POLE MOUNTED (SEE NOTE 3)	A. B. CHANCE CAT. #C710-112PB		
8	3	HEAVY DUTY DEAD END CLEVIS	A. B. CHANCE CAT. #0344 W/ SPOOL #C909-1035		
9	4	COMPRESSION STIRRUPS (FIELD TO VERIFY)	AMERICAN ELECTRIC-BLACKBURN CAT. #SCO 02		
10	2	TERMINATION CONNECTORS	G & W ELECTRIC CO. CAT. #E72KPOAB		
11	2	PHOTO-ELECTRIC EYE	FISHER-PIERCE MODEL #6601A		
12	3	LIGHTING CONTACTOR - MULTIPOLE (BUILDINGS #1, #2 & #3)	SQUARE D CAT. #8903-LW1200-V03-C6F4		
13	1	LIGHTING CONTACTOR - MULTIPOLE (FLOODLIGHTING)	SQUARE D CAT. #8903-LW80-V03-CF4G101		
14	1	DISCONNECT SWITCH	CROUSE-HINDS CAT. #EFSC2129		
15	4	9KV LIGHTNING ARRESTOR, HEAVY DUTY, DYNAVAR PDV-100 COMPLETE WITH TOP AND LOWER TERMINAL HARDWARE AND MOUNTING HARDWARE	HUBBEL OHIO BRASS CATLOG # 948 CAT. # 217608-7444		

NOTES

- 1. ALL MATERIAL SPECIFIED IN THE BILL OF MATERIAL SCHEDULE MAY BE SUBSTITUTED WITH CLIENT A SCHEDULE MAY BE SUBSTI
- 2. ELECTRICAL SUB-CONTRACTOR SHALL PURCHASE SUITABLE FOR PLUG PROVIDED WITH HEAT PUMP
- 3. ELECTRICAL SUB-CONTRACTOR SHALL ALSO PURCHASE & INSTALL 5 AMP FUSES IN FUSE HOLDER FOR THREE 25 KVA TRANSFORM ERAS & A 30 AMP FUSE FOR THE 167 KVA TRANSFORM ERAS
- 4. SEE DWG. #E-104 FOR LEGEND.
- 5. ALL CONDUCTORS SHALL BE COPPER, UNLESS NOTED OTHERWISE.

LEGEND

- LIGHTING FIXTURE, 250 WATT, METAL HALLS PENDANT MOUNT
- LIGHTING FIXTURE, 250 WATT, METAL HALLS FLEXIBLE PENDANT MOUNT
- LIGHTING FIXTURE, 200 WATT, INCANDESCENT
- LIGHT SWITCH
- LIGHT SWITCH, WEATHER PROOF
- RECEPTACLE (250V) WITH GFI CIRCUIT BREAKER IN PANEL
- GROUND FAULT RECEPTACLE (125V), WEATHER PROOF
- GROUND FAULT RECEPTACLE (125V)
- LIGHTING FIXTURE, FLOODLIGHT, METAL HALIDE
- 400 WATT AND 175 WATT ( AS SPECIFIED ON THE DRAWINGS )
- PHOTO ELECTRIC EYE
- 25 KVA, POLE MOUNTED, 7620V-120/24-
- PPB POWER PANEL B LOCATED AT RESTROOM
- DISTRIBUTION POWER PANEL FOR TRAILER FEEDS
- POWER PANELS PROVIDED WITH TRAILERS
- GROUND ROD
- 50 GAL. HOT WATER HEATER

PWU PRESSURE WASH UNIT

LIGHTING FIXTURE, 40 WATT, FLUORESCENT, 2 BULB WITH EMERGENCY PACK

LIGHTING PANEL IN BUILDINGS #1, #2 & # 3

CIRCUIT DESIGN SHOWING HOT (VERT.), NEUTRAL (SLANTED) & GROUND (G)





+10-

MORRISON KNU DSEN ENVIRONMENTAL GROUP

Jacobs Engineering Gro Inc.
Central Region Houston Texas

10-G175-31

DWG. NO. E-104

NONE

BIOREMEDIATION FACILITY

CRANE NSWC ELECTRICAL - LTG. FIXTURE SCHED., B. O. M -

& LEGEND

DIR=\_\_\_\_\_ DWG=\_\_\_

E-100 ELECTRICAL KEY PLAN

TITLE

DWG. NO.

REFERENCE DRAWINGS

TITLE

P.H. KLM SDH 2/96
RLN KLM SDH 1/96
BY CHK APP DATE

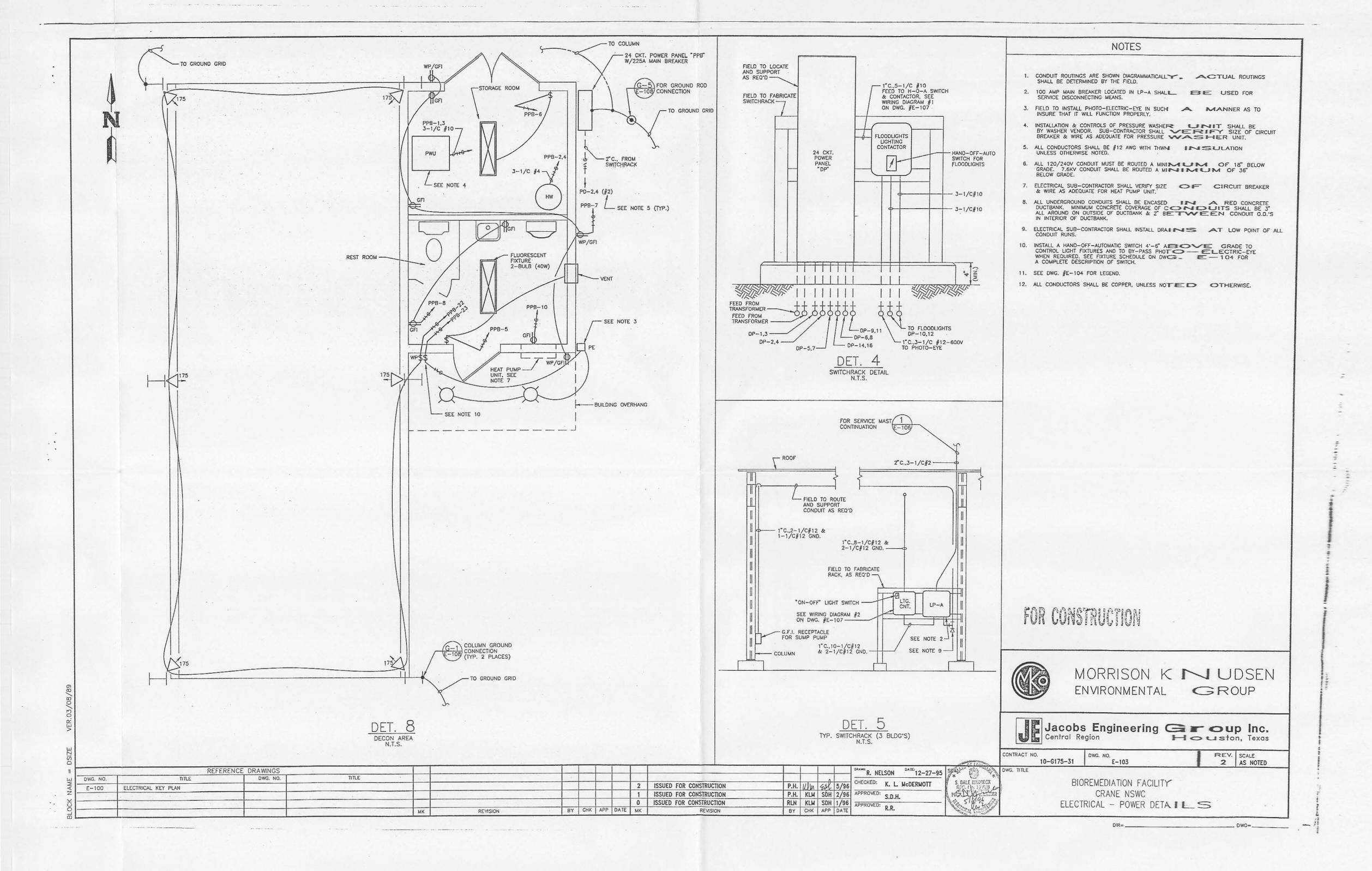
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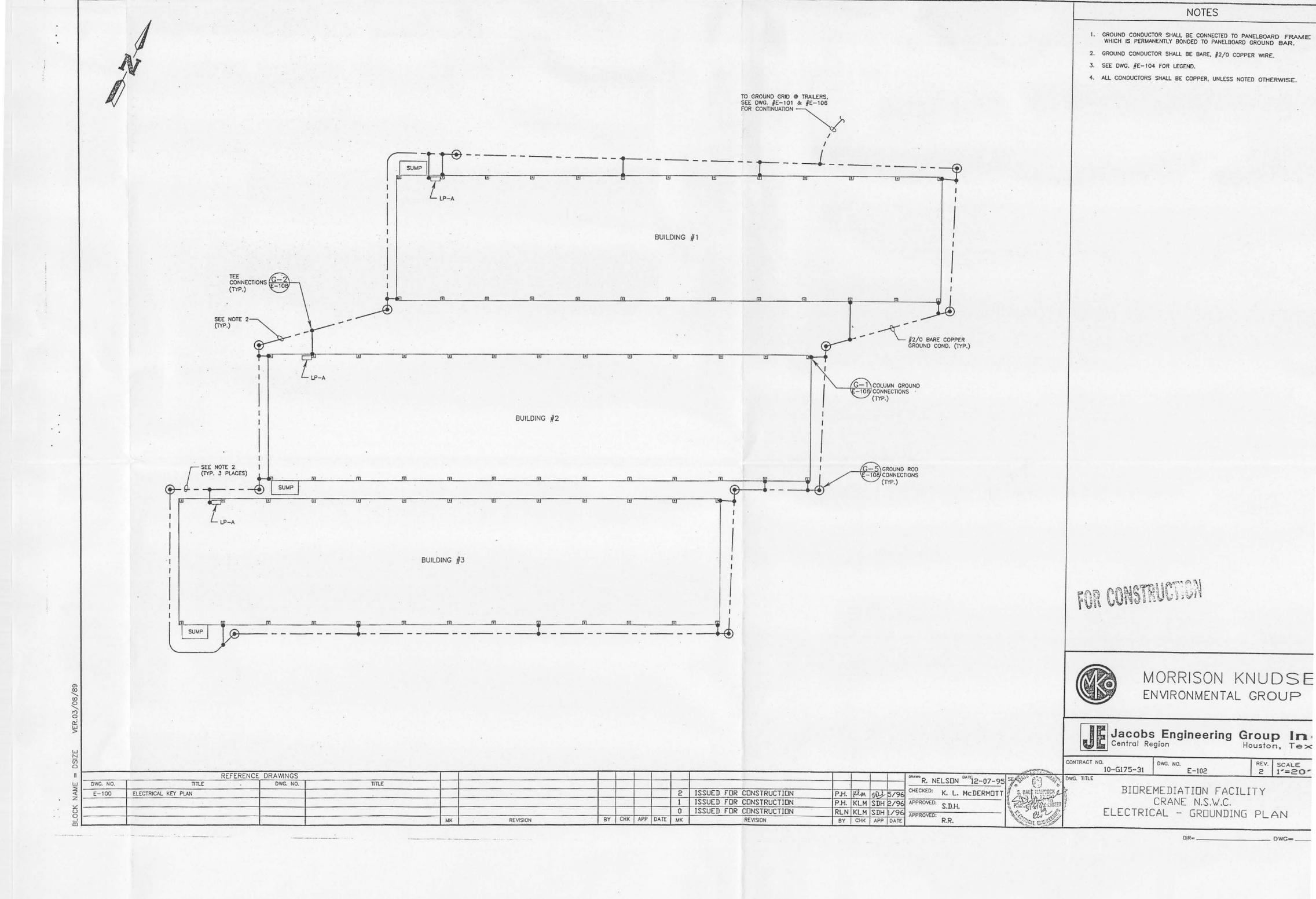
CHECKED: K. L. McDERMOTT

APPROVED: S.D.H.

APPROVED: R.R. 2 ISSUED FOR CONSTRUCTION
1 ISSUED FOR CONSTRUCTION
0 ISSUED FOR CONSTRUCTION BY CHK APP DATE MK REVISION

R. NELSON DATE 12-28-95 SEAL NE





### NOTES

- FIELD TO INSTALL NEW POLE (35'-0" POLE, CL-2, 6'-0" DEEP IN UNDISTURBED EARTH) AND FIELD TO INSTALL 2-400 WATT METAL HALIDE FLOODLIGHTS.
- GROUND CONDUCTOR SHALL BE TERMINATED AT ALL POWER & LIGHTING PANELS
- ALL CONDUCTORS SHALL BE #2 AWG, 600V, WITH THWN INSUALTION UNLESS OTHERWISE NOTED.
- ELECTRICAL SUB-CONTRACTOR TO VERIFY SUPPLY VOLTAGE BEFORE PURCHASING TRANSFORMER.
- ALL CONDUIT RUNS ARE SHOWN DIAGRAMMATICALLY. ELECTRICAL SUB-CONTRACTOR SHALL DETERMINE EXACT ROUTE & SUPPORT.
- 6. ALL UNDERGROUND CONDUITS SHALL BE ENCASED IN A RED CONCRETE DUCTBANK. MINIMUM CONCRETE COVERAGE OF CONDUITS SHALL BE ALL AROUND ON OUTSIDE OF DUCTBANK & 2" BETWEEN CONDUIT O.D.'S IN INTERIOR OF DUCTBANK.
- 7. ALL 120/240V CONDUITS MUST BE ROUTED A MINIMUM OF 18" BELOW GRADE. ALL 7.6 KV CONDUITS MUST BE ROUTED A MINIMUM OF 36" BELOW GRADE.
- 8. ALL GROUND RODS SHALL BE BONDED TOGETHER WITH A #2/O BARE COPPER BONDING CONDUCTOR.
- 9. ELECTRICAL SUB-CONTRACTOR SHALL INSTALL #6 BARE COPPER GROUND CONDUCTOR ALONG LENGTH OF POLE & WRAP WIRE AROUND BUTT OF POLE SEVERAL TIMES BEFORE INSTALLING POLE IN GROUND.
- 10. ELECTRICAL SUB-CONTRACTOR SHALL LABEL MAIN BREAKERS AS "SERVICE DISCONNECT."
- 11. SEE DWG. #E-104 FOR LEGEND.
- FLOODLIGHTS SHALL BE INSTALLED A MINIMUM OF 5'-0" FROM BARE OVERHEAD ENERGIZED CONDUCTORS.
- 13. ALL CONDUCTORS SHALL BE COPPER, UNLESS NOTED OTHERWISE.

tor construction



MORRISON KNUDSEN ENVIRONMENTAL GROUP

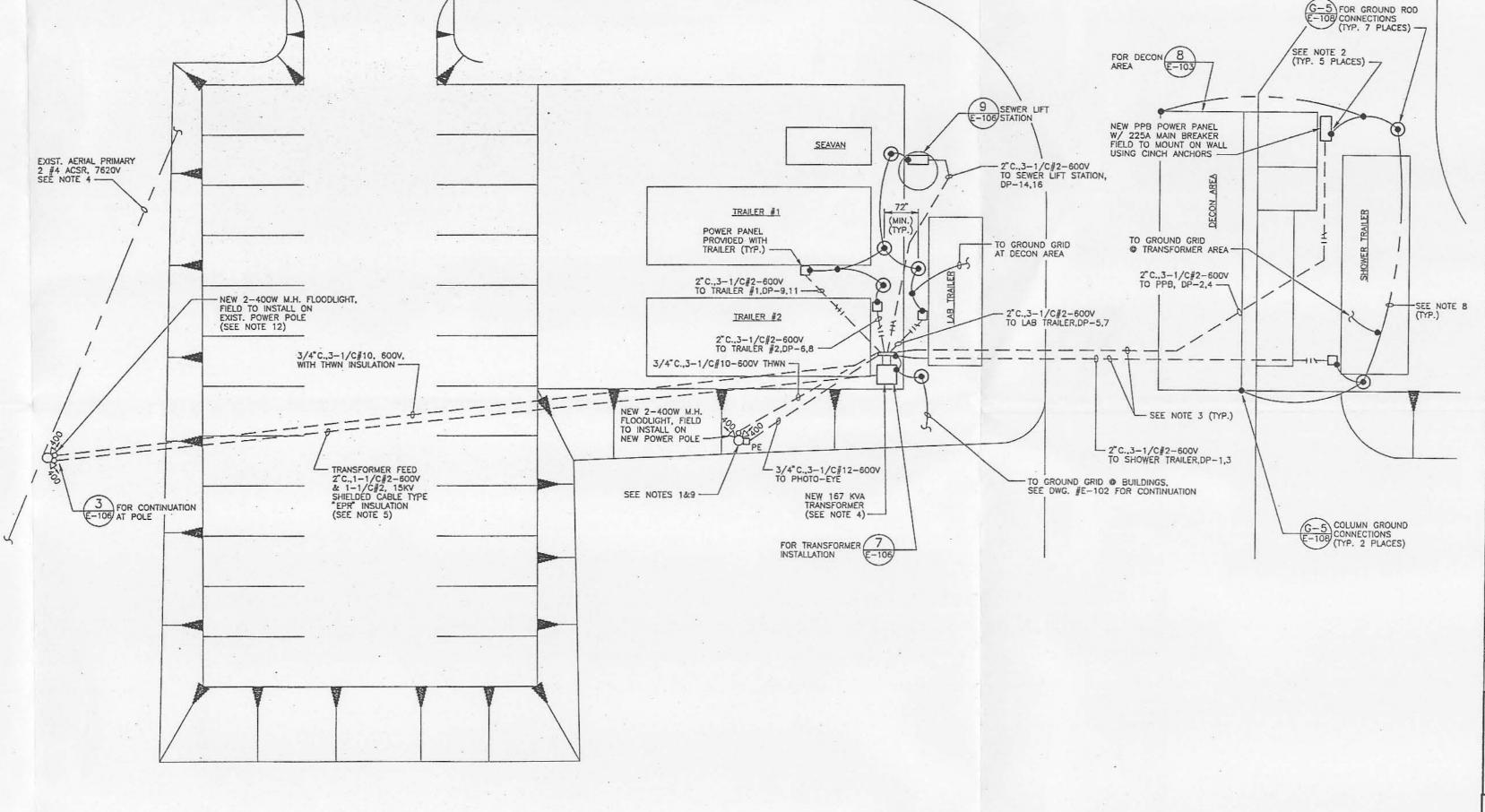
Jacobs Engineering Group Inc Central Region Houston, Texas

CONTRACT NO. 10-G175-31

DWG. TITLE

REV. SCALE 2 1 = 10'-0

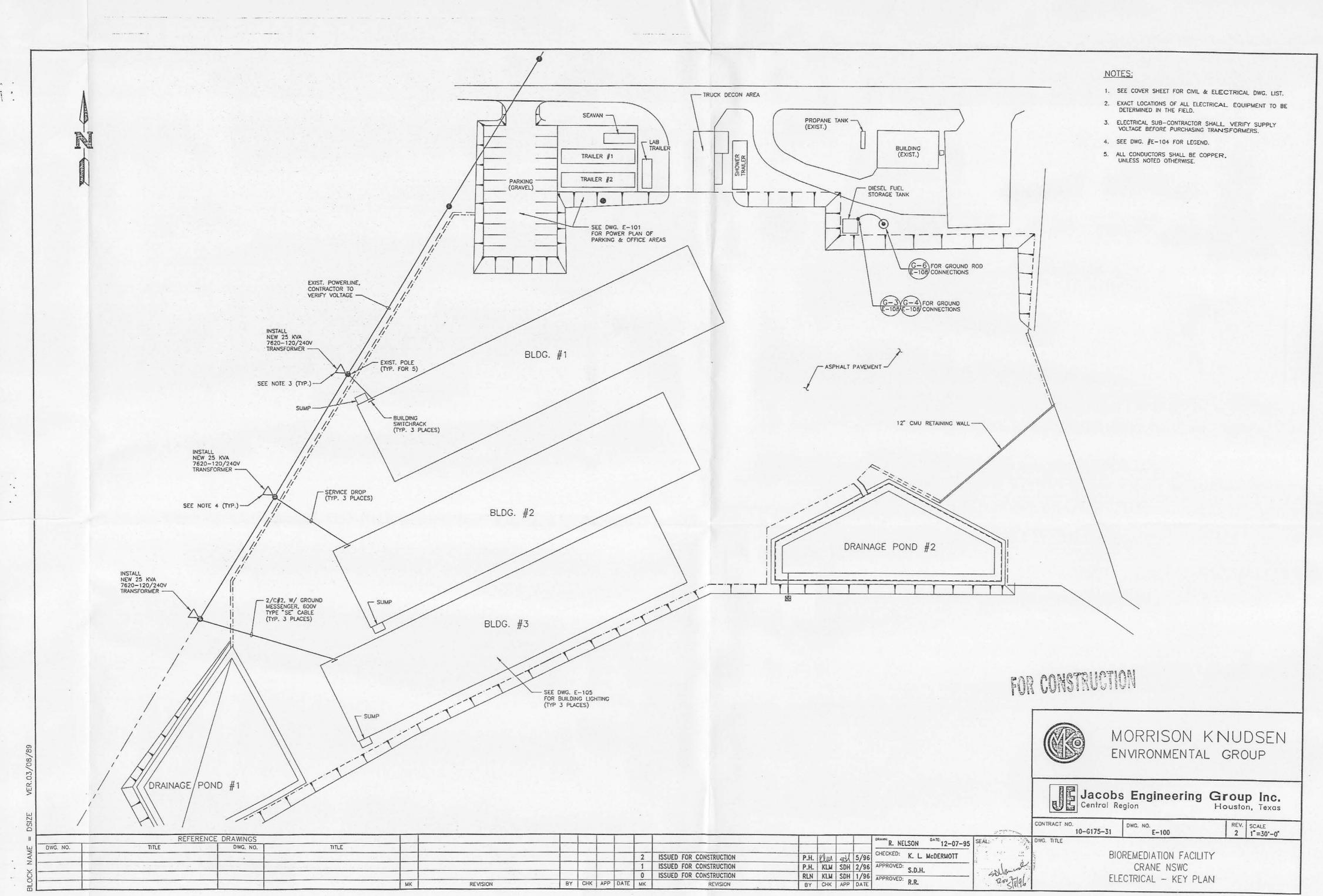
BIOREMEDIATION FACILITY CRANE NSWC ELECTRICAL - POWER PLAN



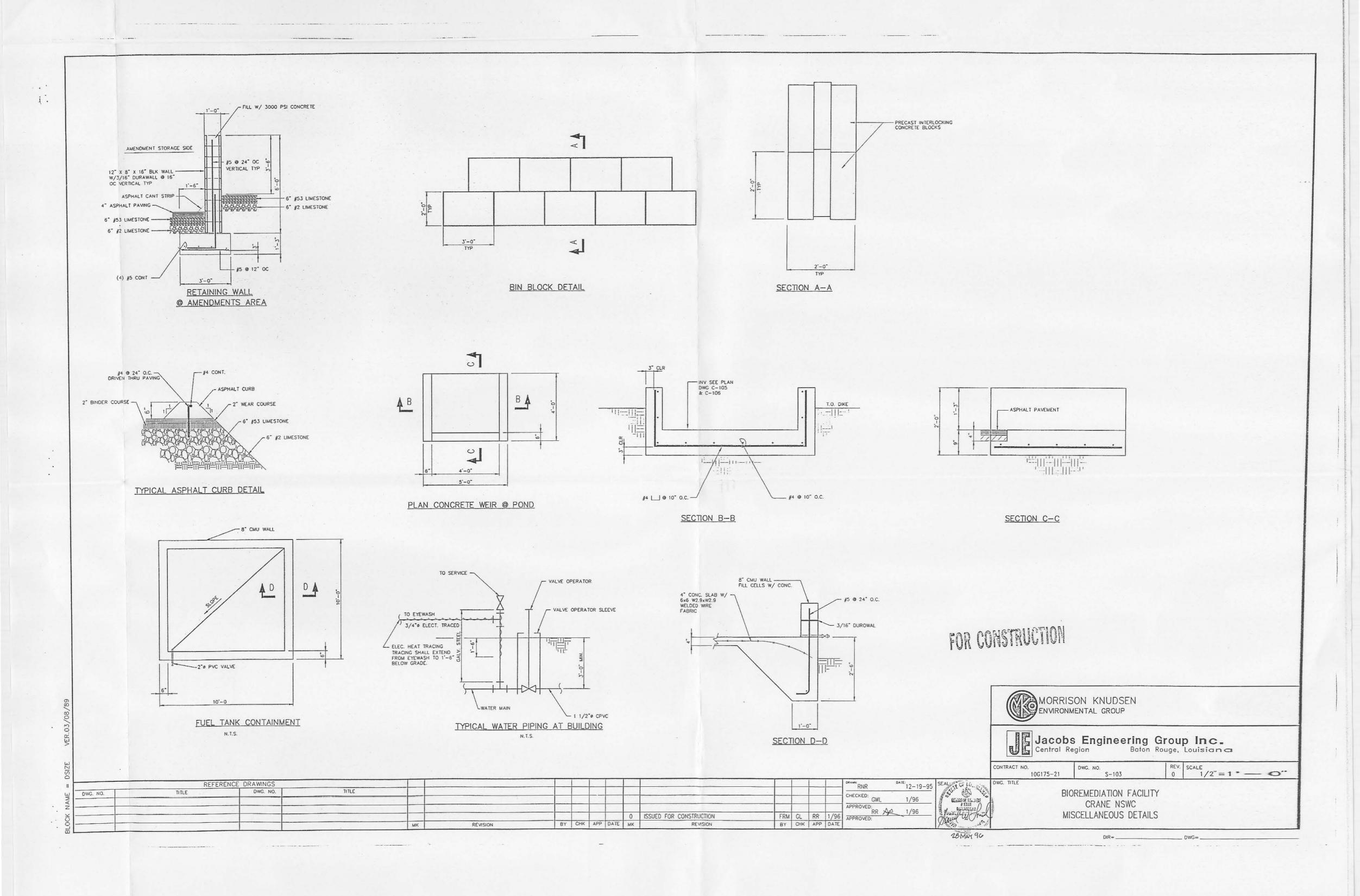
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BY CHK APP DATE APPROVED: R.R. BY CHK APP DATE MK MK REVISION

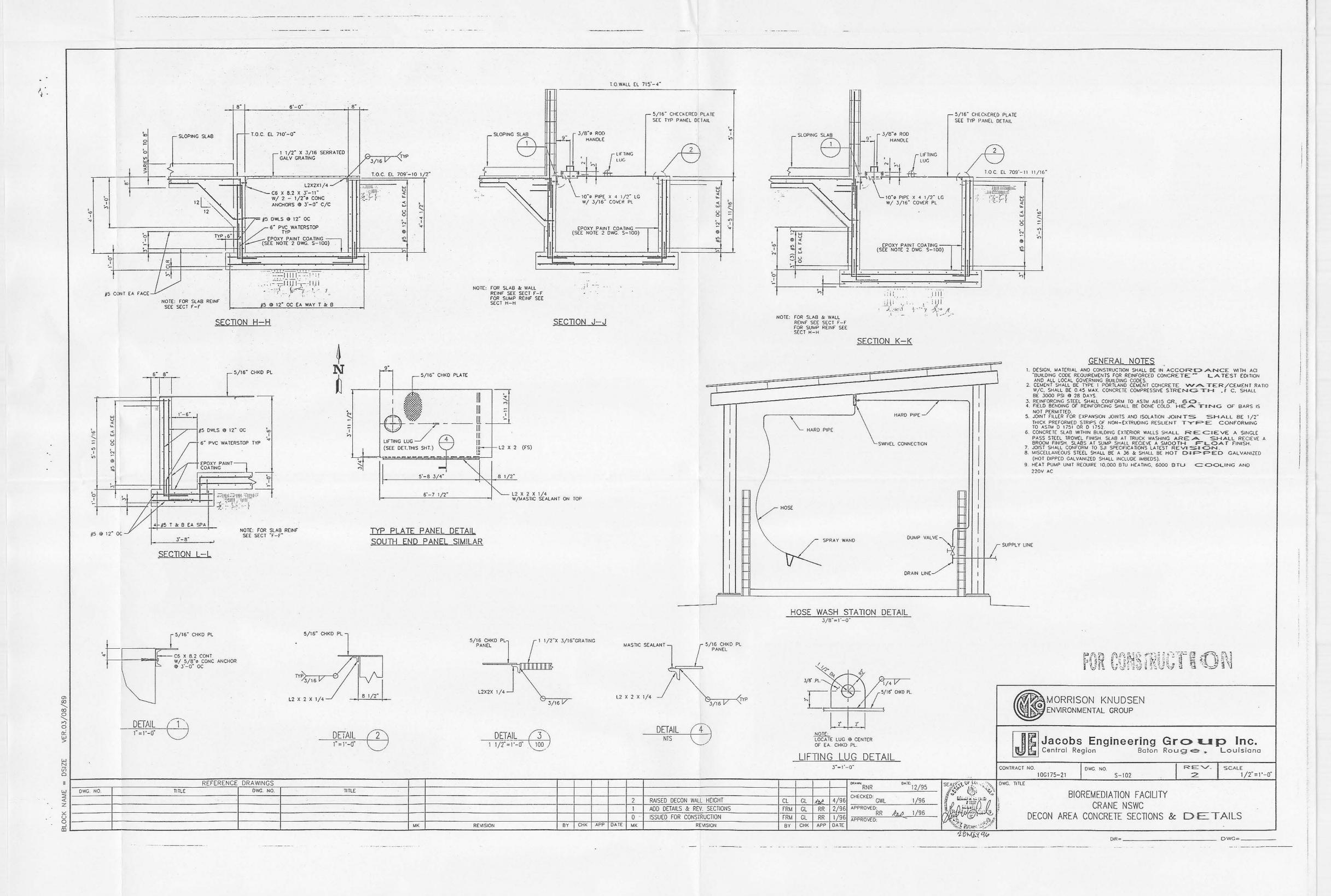
P.H. KLM SDH 2/96 CHECKED: K. L. McDERMOTT

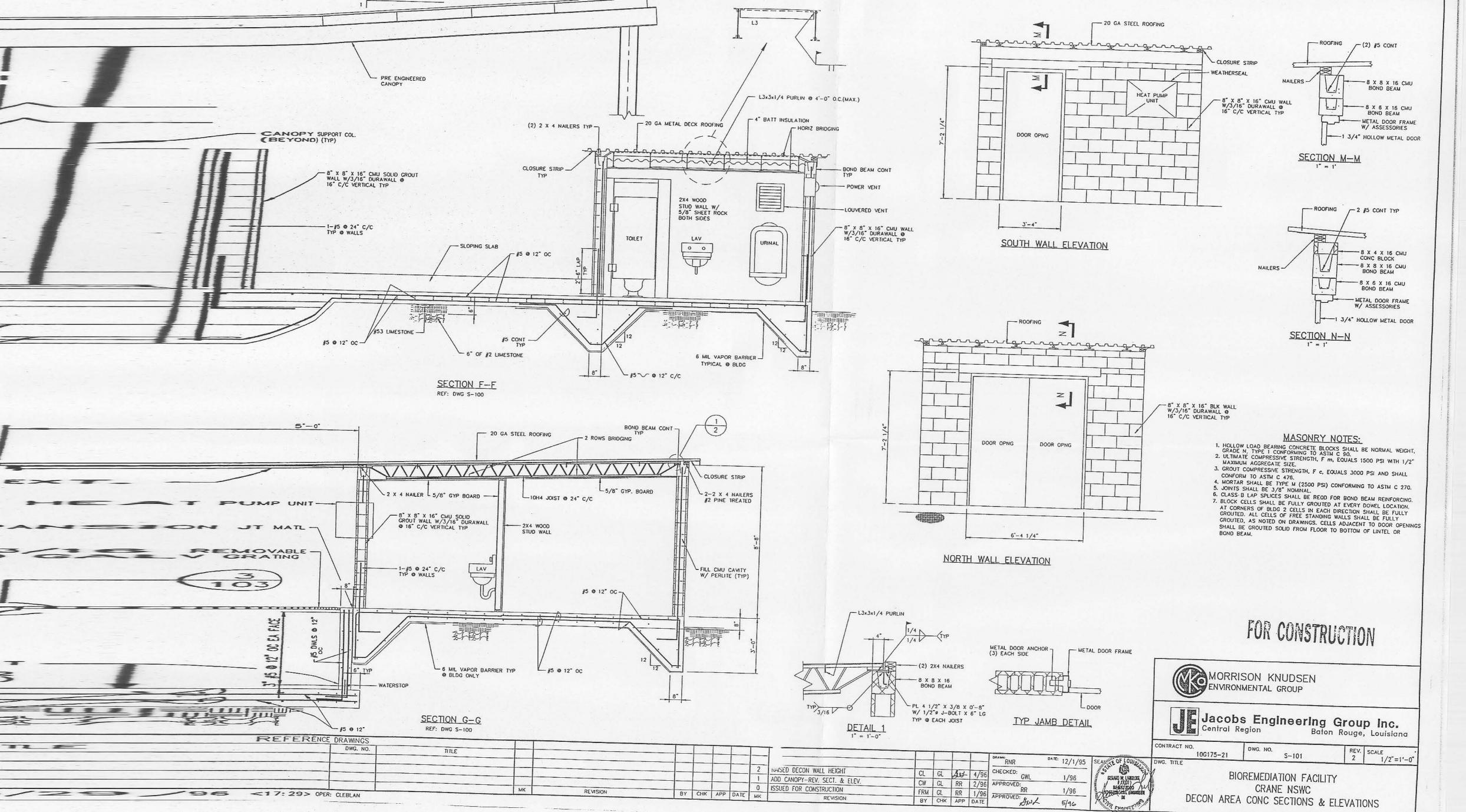
APPROVED: S.D.H. S. DALE HAMOODING

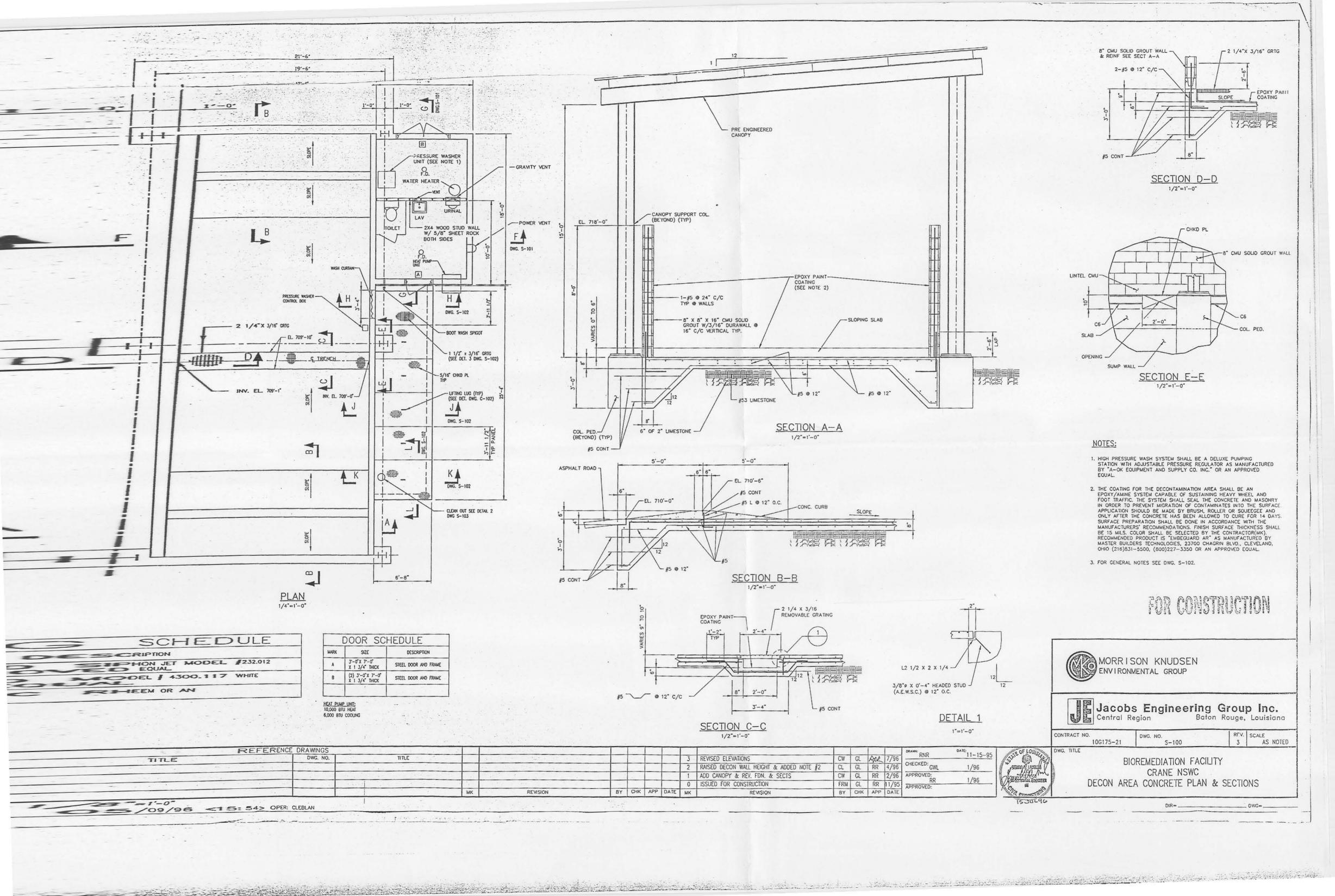


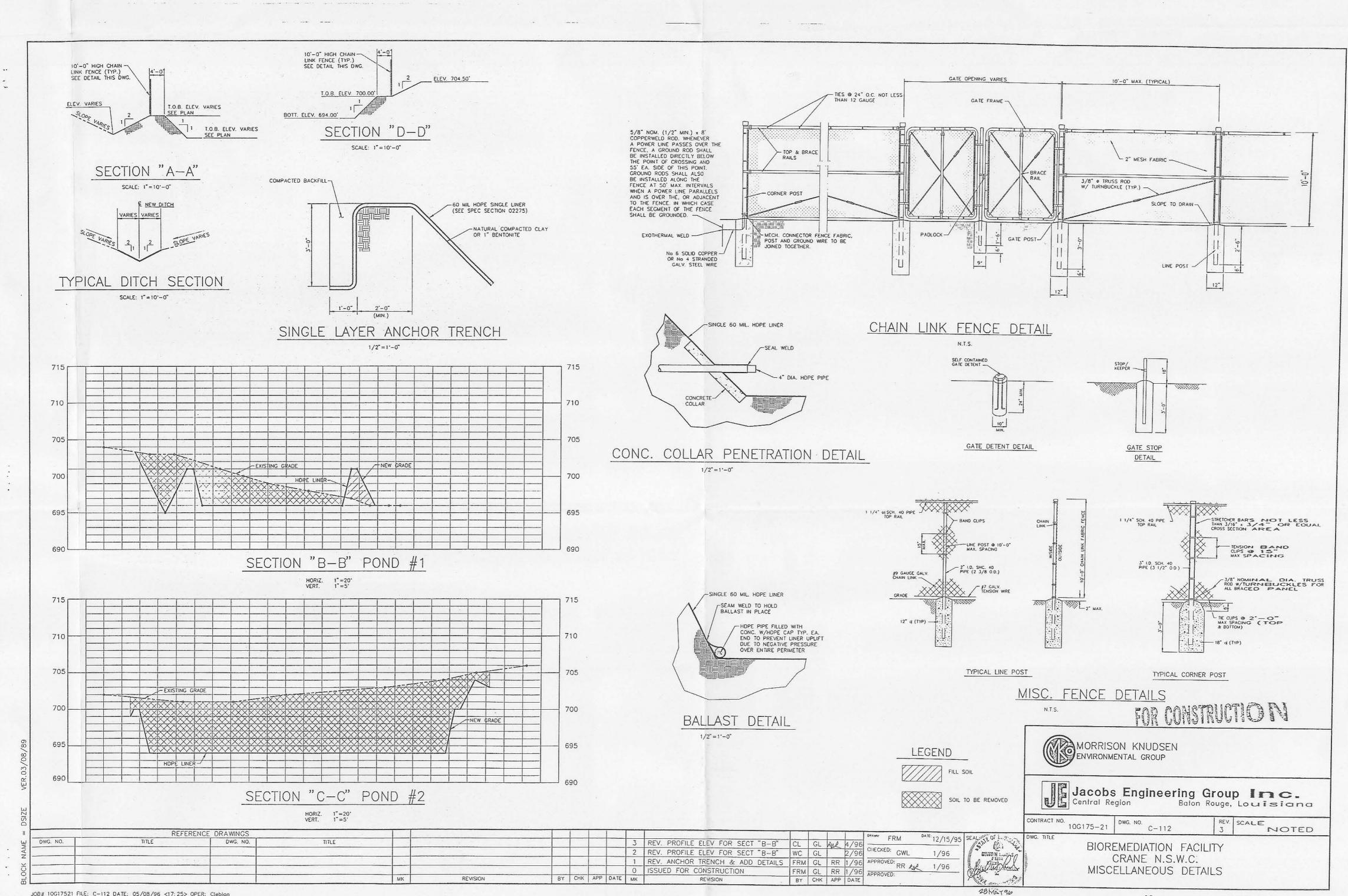
DIR=\_\_\_\_









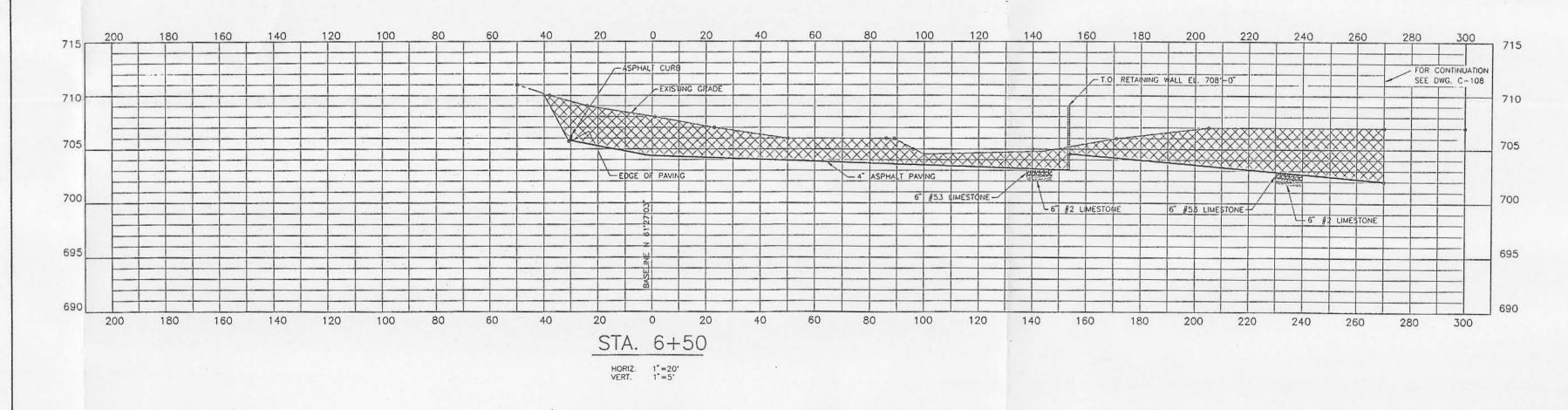


JOB# 10G17521 FILE: C-112 DATE: 05/08/96 <17:25> OPER: Cleblan

\_\_ DWG= \_\_

700

LEGEND



REVISION

1 REVISED FOR NEW LOCATIONS 0 ISSUED FOR CONSTRUCTION

BY CHK APP DATE MK

FOR CONSTRUCTION



Jacobs Engineering Group Inc.
Central Region Baton Rouge, Louisiana

CONTRACT NO. 10G175-21 DWG. NO. C-111

SEAL OF I

BIOREMEDIATION FACILITY
CRANE N.S.W.C.
CROSS SECTIONS — SHT.3

28 HAY 94

DRAWN: C. WILLIS DATE: 1/96

1/96

CHECKED: GWL

CL GL AJ 4/96
FRM GL RR 1/96
BY CHK APP DATE

GWL 1/96
APPROVED:

APPROVED:

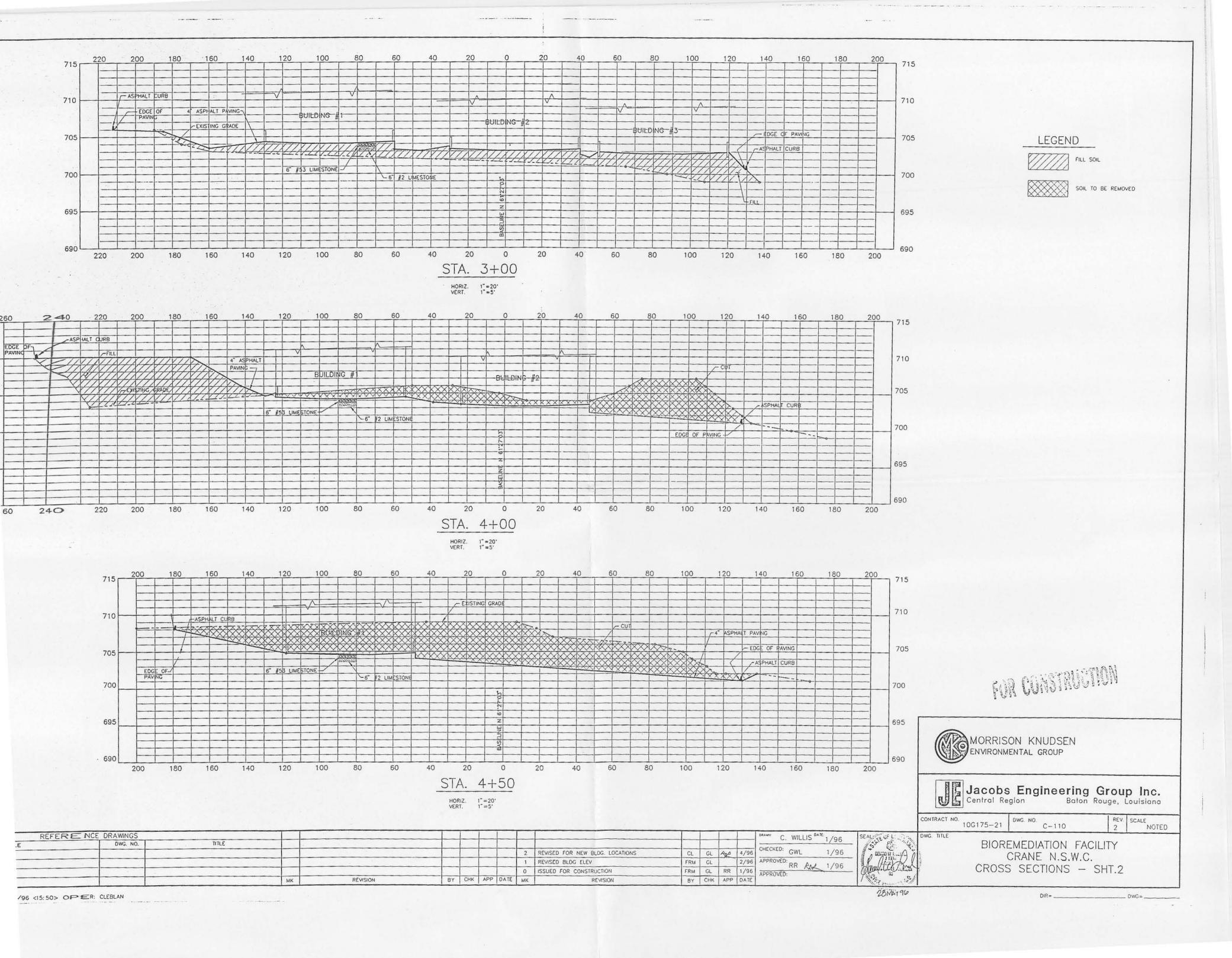
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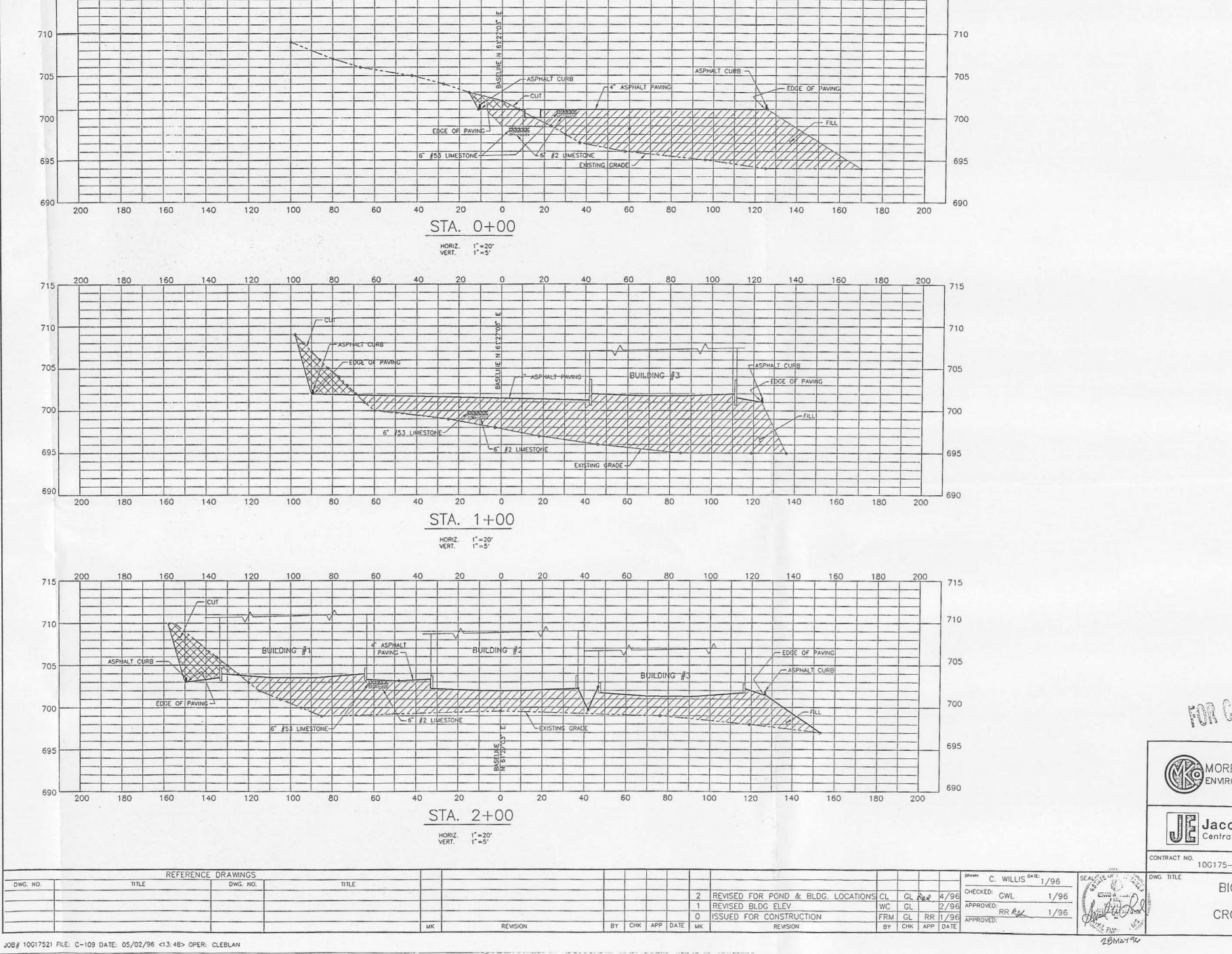
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REFERENCE DRAWINGS

DWG. NO.

TITLE





LEGEND

FOR CONSTRUCTION

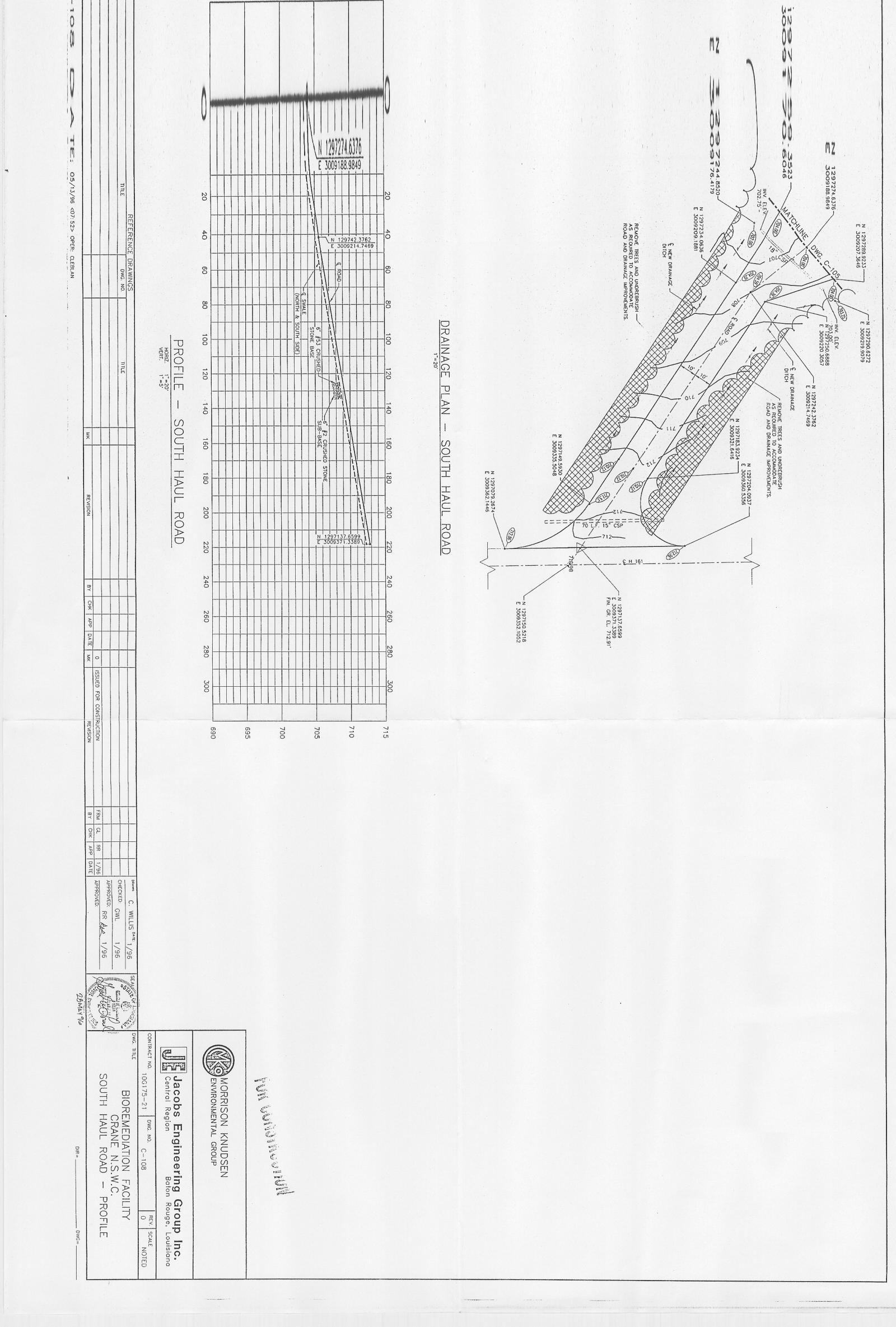


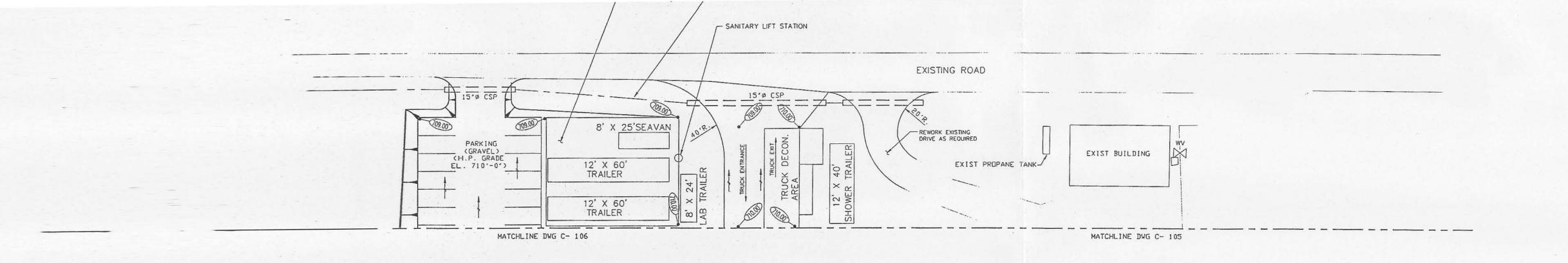
Jacobs Engineering Group Inc.
Central Region Baton Rouge, Louisiana

CONTRACT NO. 10G175-21 DWG. NO. C-109

REV. SCALE 2 NOTED

BIOREMEDIATION FACILITY CRANE N.S.W.C.
CROSS SECTIONS - SHT.1





## for construction

### LEGEND

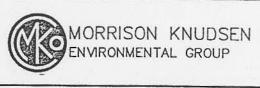


DENOTES DRAINAGE FLOW

DENOTES NEW ELEVATION --- DENOTES NEW ASPHALT BERM

DENOTES EXISTING POWER POLE

DENOTES EXISTING SANITARY SEWER MANHOLE





Jacobs Engineering Group Inc.
Central Region Baton Rouge, Louisiana

284496

. 10G175-21 DWG. NO. C-107

DATE: 11/29/95 SEAL: OF LUCY IN CONTROL OF LUCY IN REFERENCE DRAWINGS
DWG. NO. TITLE CL GL Ap 4/96
CW GL RR 2/96
FRM GL RR 1/96
BY CHK APP DATE

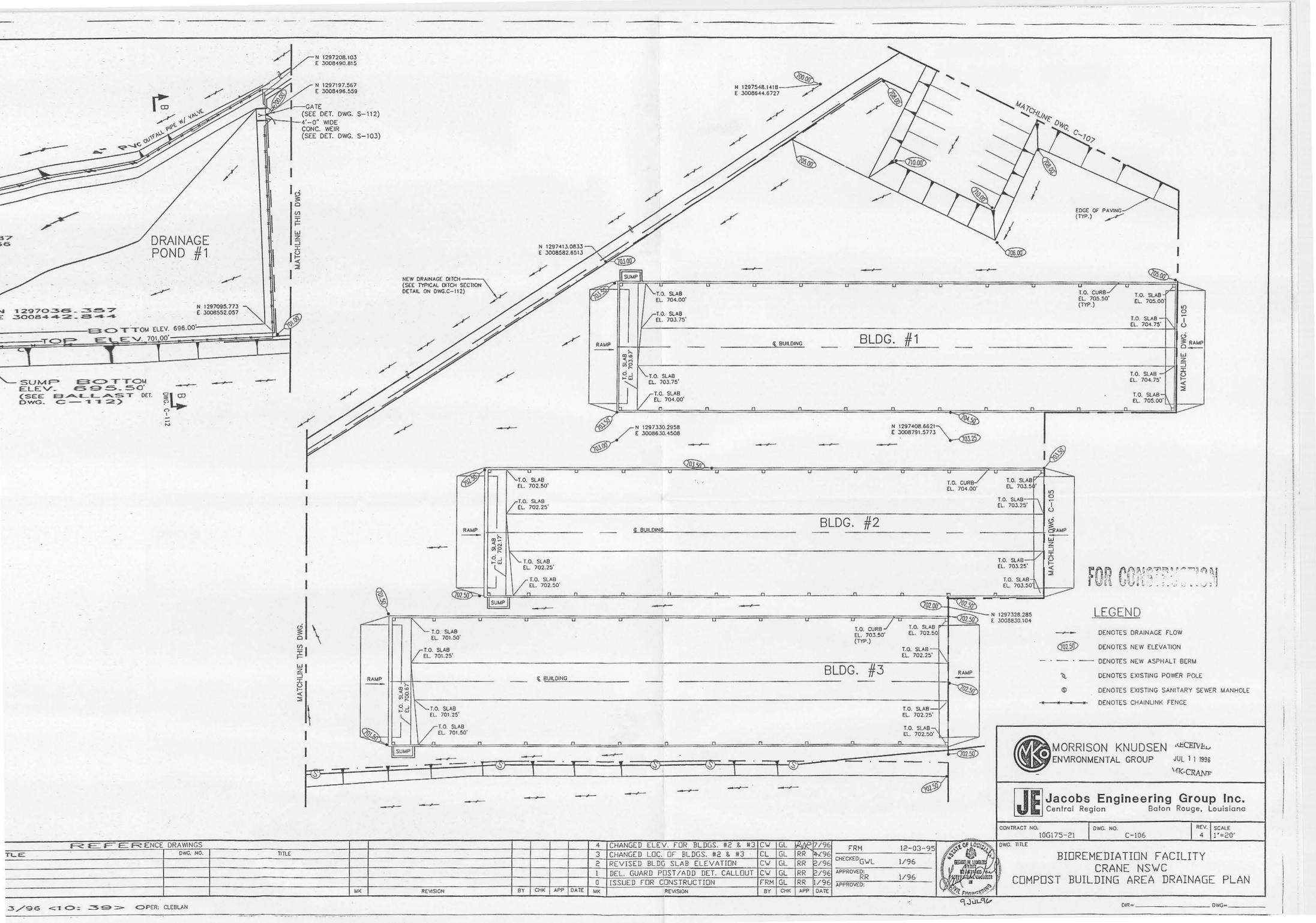
FRM 11/29/9

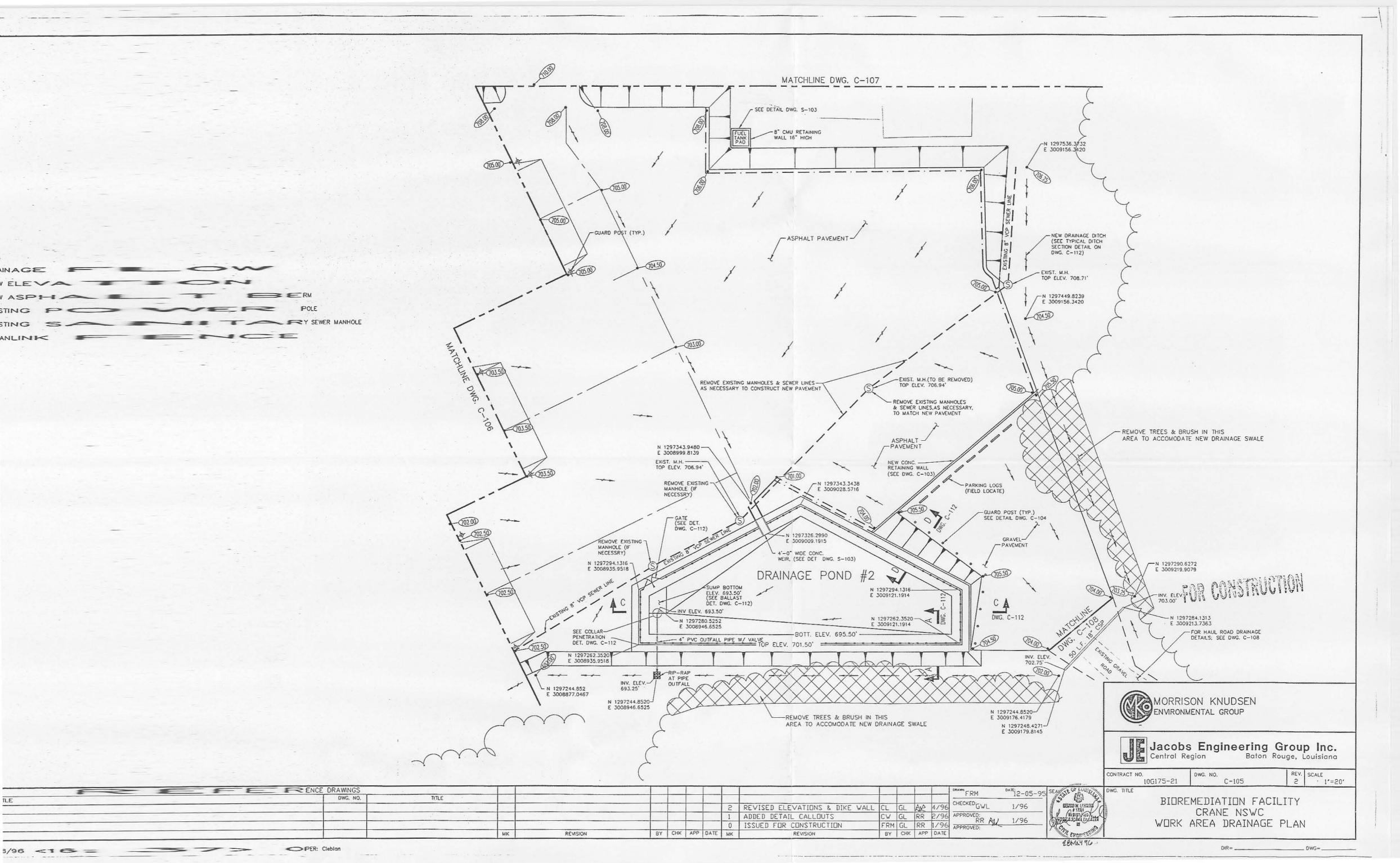
CHECKED:
GWL 1/96
RR APPROVED:
APPROVED:
APPROVED:
APPROVED:
APPROVED: TITLE 2 ADDED LARGER RADIUS TO TURNOUTS 1 ADDED ENTRANCE/EXIT NOTES

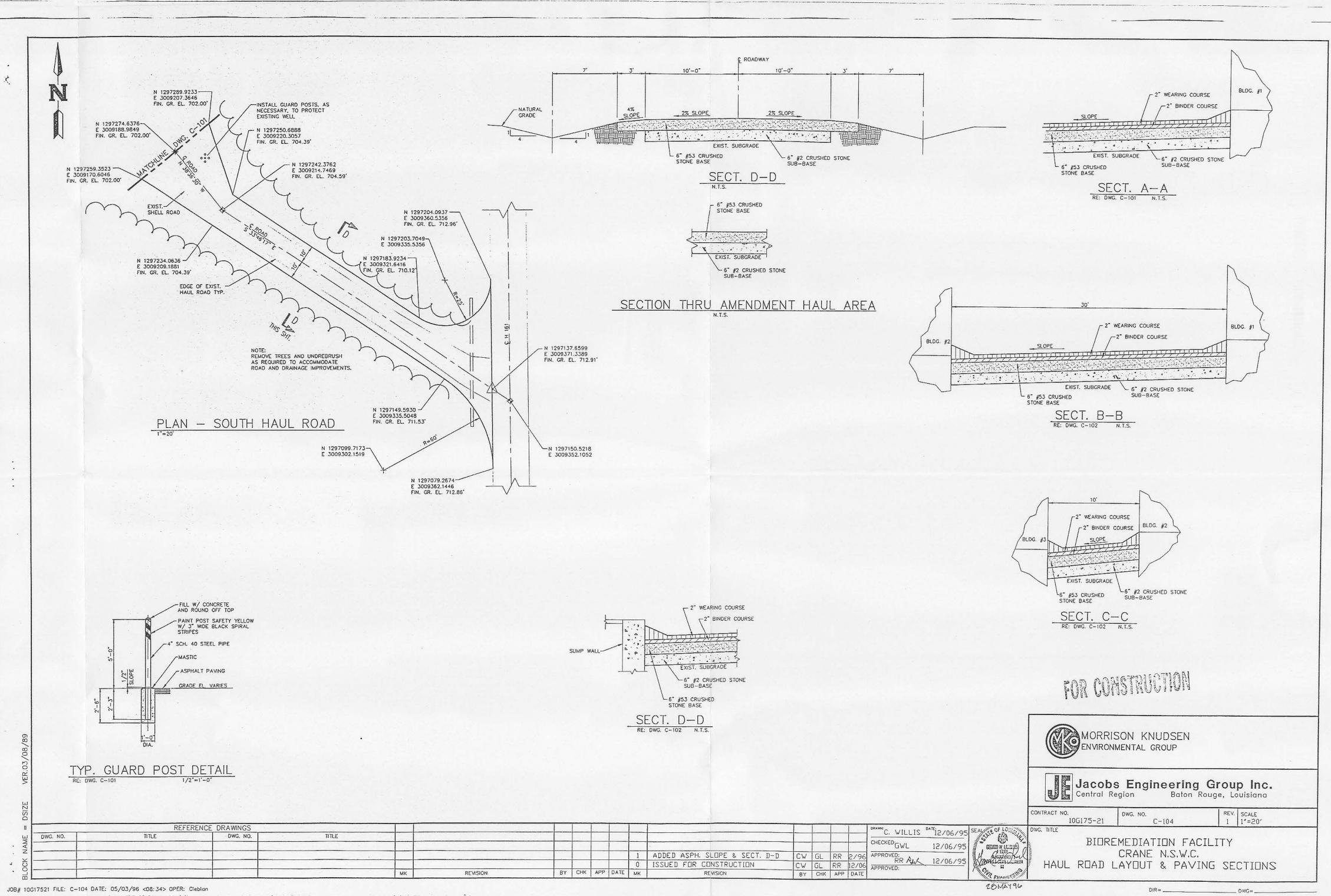
REVISION

BY CHK APP DATE MK REVISION

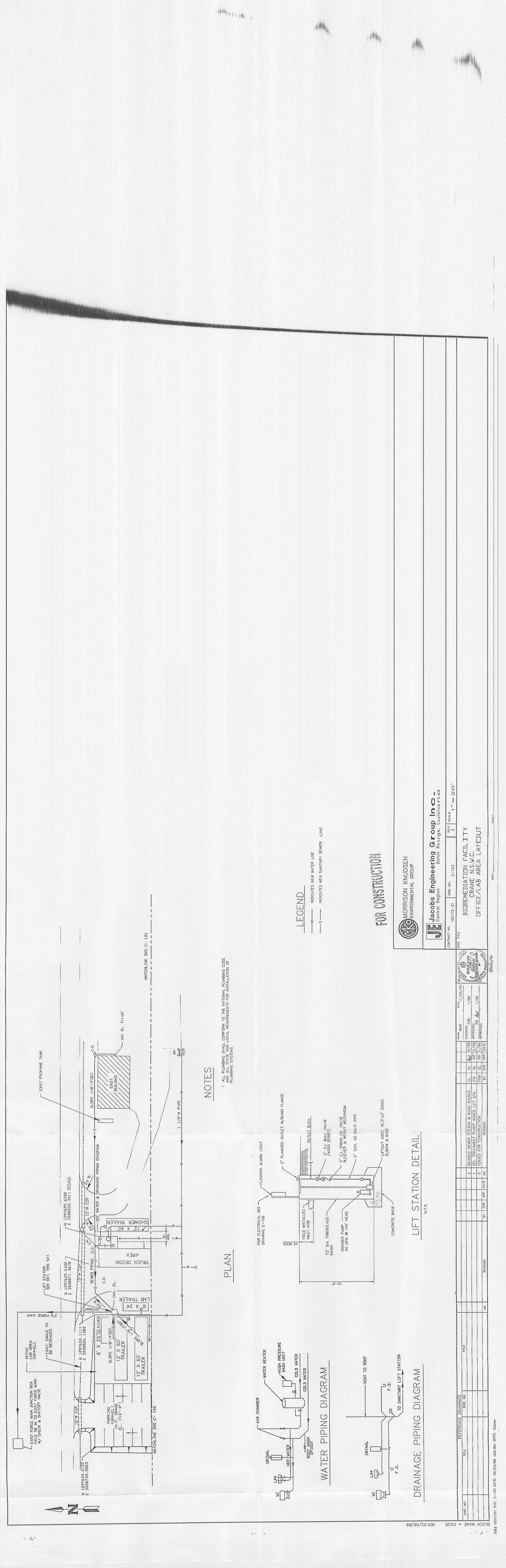
BIOREMEDIATION FACILITY CRANE N.S.W.C. DFFICE/LAB AREA DRAINAGE PLAN



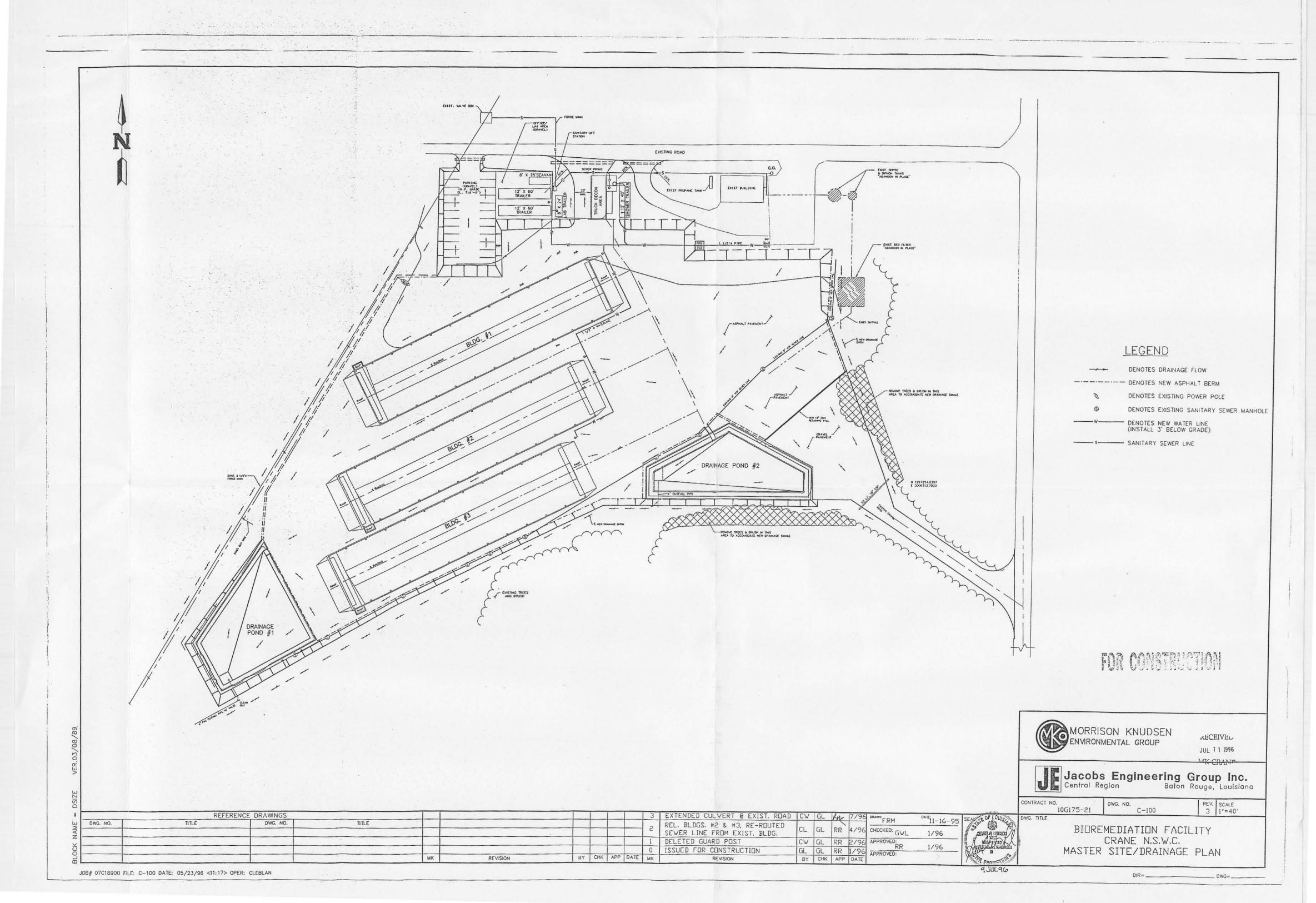


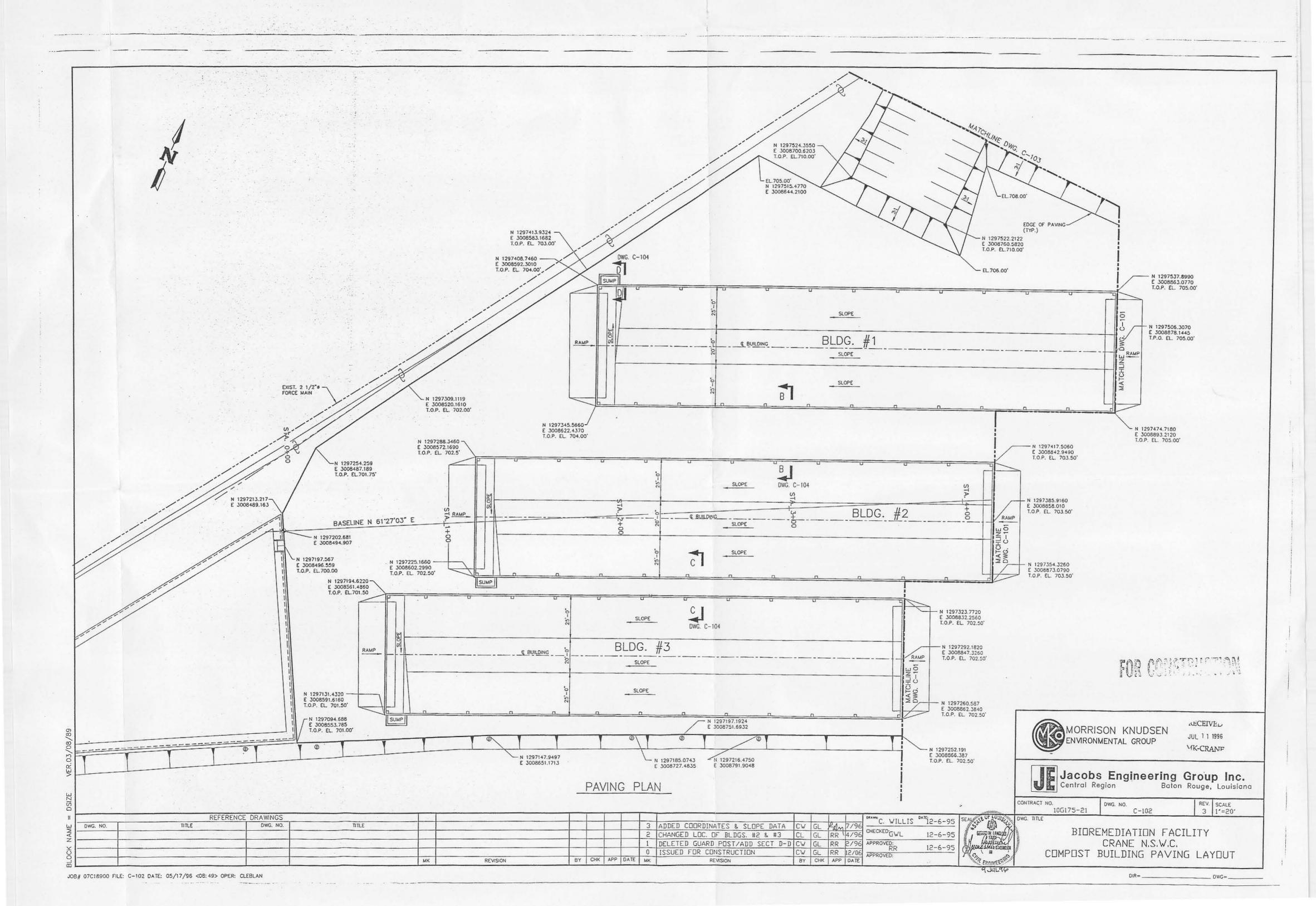


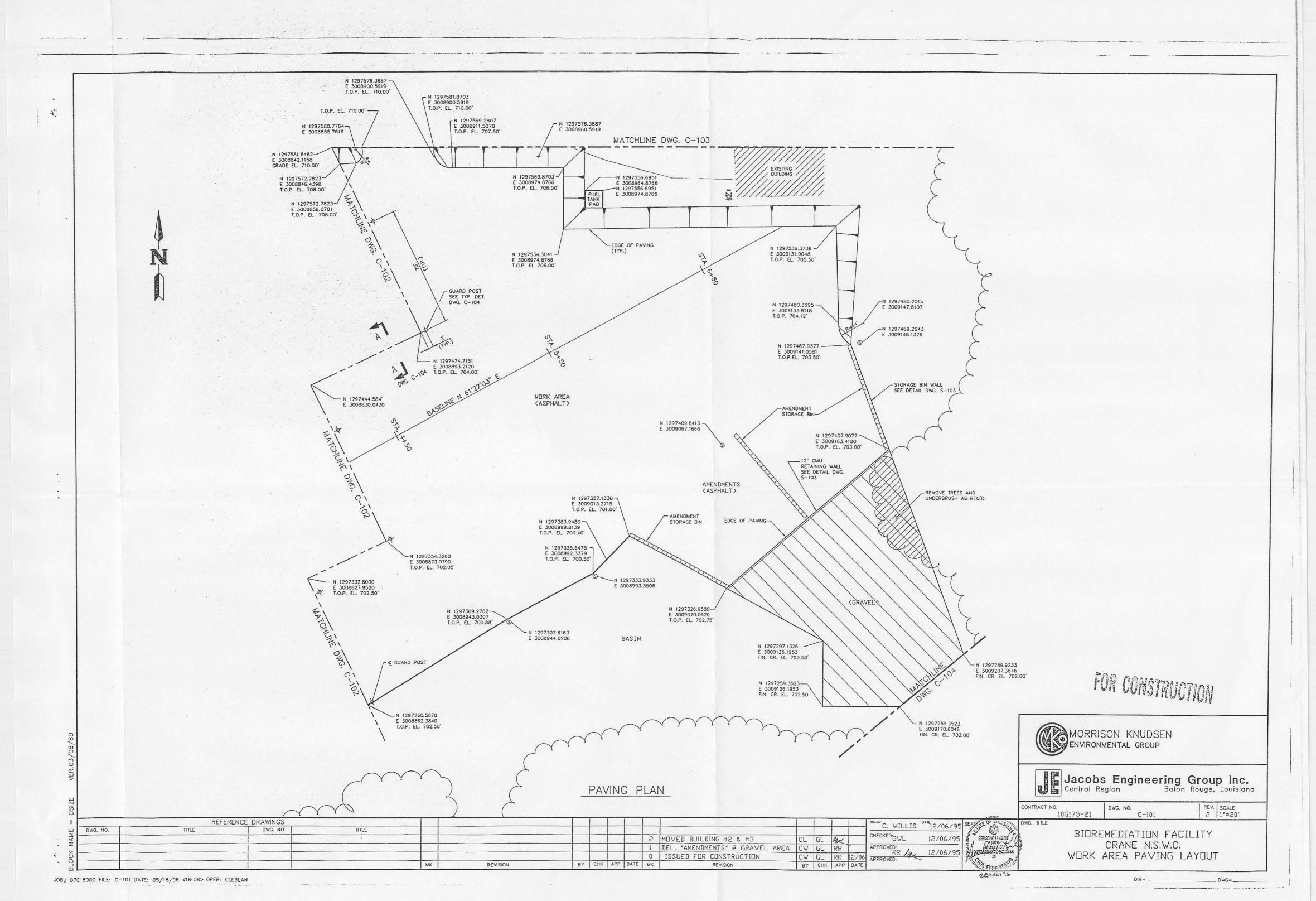
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# DEPARTMENT OF THE NAVY

# CRANE DIVISION NAVAL SURFACE WARFARE CENTER CRANE, INDIANA BIOREMEDIATION FACILITY



### DRAWING INDEX

### DWG. NO.

C-100 C-101 C-102 C-103 C-104 C-105 C-106 C-107 C-108 C-109 C-110 C-111

HAUL ROAD DRAINAGE PLAN & DETAILS
CROSS SECTIONS - SHT. 1
CROSS SECTIONS - SHT. 2
CROSS SECTIONS - SHT. 3
MISCELLANEOUS DETAILS

DECON AREA CONCRETE PLAN & SECTIONS
DECON AREA SECTIONS & ELEVATIONS
DECON AREA SECTIONS & MISCELLANEOUS DETAILS

S-101 S-102 S-103

### DWG. NO.

E-100 E-101 E-102 E-103 E-104 E-105 E-106 E-107 E-108

### ELECTRICAL DRAWING LIST

WORK AREA PAVING LAYOUT COMPOST BUILDING PAVING LAYOUT OFFICE/LAB AREA LAYOUT HAUL ROAD LAYOUT & PAVING SECTIONS WORK AREA DRAINAGE PLAN

COMPOST BUILDING DRAINAGE PLAN

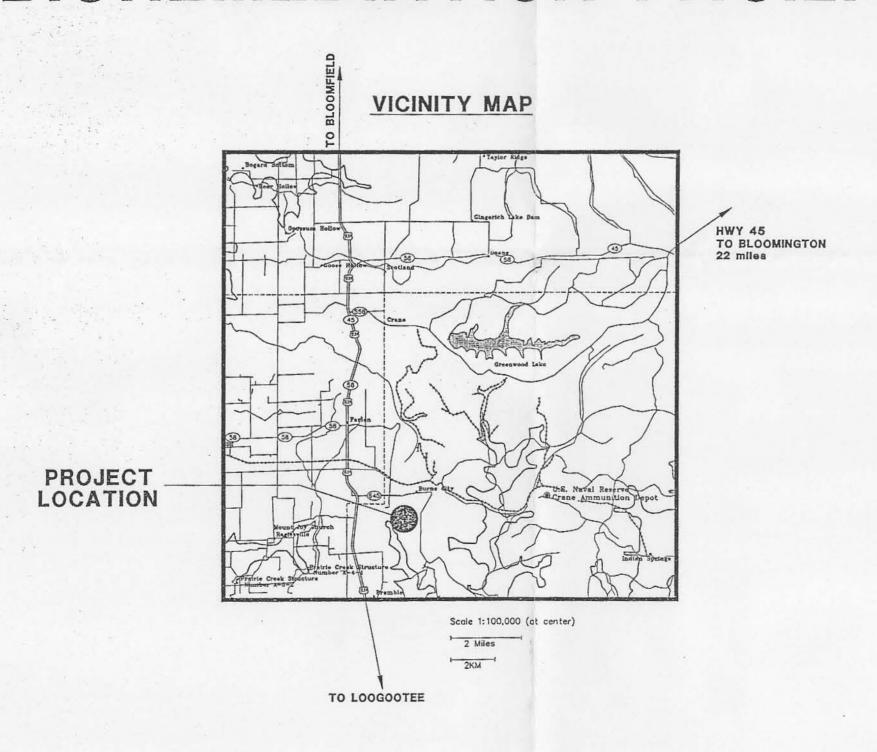
KEYPLAN
POWER PLAN
GROUNDING PLAN
POWER DETAILS
LIGHTING FIX. SCHEDULE, B.O.M. & LEGEND
TYP. LIGHTING FOR BLDG'S. #1, #2 & #3
POWER DETAILS
SCHEMATICS & LIGHTING DETAILS
TYPICAL GROUNDING DETAILS
PANEL SCHEDULES

### SPECIFICATION INDEX

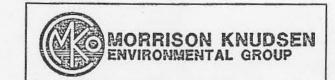
### SECTION

### DESCRIPTION

SITE CLEARING
CONCRETE REINFORCEMENT
CAST-IN-PLACE CONCRETE
MEMBRANE LINING SYSTEMS
CPVC UNDERGROUND PIPE
ASPHALTIC CONCRETE PAVING



FOR CONSTRUCTION





JEG JOB NO. 10G175-21